



Operation Manual & Parts List For MB11

Milltronics Manufacturing Company
1400 Mill Lane
Waconia, MN 55387 USA
Phone 952-442-1410 Fax 952-442-6457
www.milltronics.net

INSTRUCTION MANUAL

PRELIMINARY INFORMATION

UNCRATING:

Carefully remove the protective crating and skid so that the machine and parts are not marred, scratched or otherwise damaged. In the event of any damage in transit, notify our representative at once as well as the transportation company making final delivery. The machine should be lifted from the base of the crate by placing a sling under the overarm.

SHORTAGES:

Inspect the complete shipment carefully against the itemized packing list to make sure that all items are present. In the event damage or shortages are noticed they should be reported immediately to the delivering carrier and to the representative from whom the machine was purchased with a clear indication as to which parts have not been received.

CLEANING:

Thoroughly clean the rust preventive materials from the machine with mineral spirits, or other suitable solvents. Do not move the table, saddle, knee or other moving parts until all of the sliding way surfaces have been well cleaned and lubricated. After cleaning carefully move to a limit stop in one direction the table, saddle and knee, and clean and lubricate the exposed way surfaces. Then move each of these units to the opposite limit stop and similarly clean and lubricate the exposed way surfaces. Loosen the two locks to unlock the overarm and move this forward and backward to the extreme position in order to clean and lubricate.

FOUNDATION:

For best performance it is important that the machine be placed on a solid foundation and that it be level. A solid concrete floor is desirable, but a firm wooden floor, freed from vibration, may be suitable. If the machine is to be located on an upper floor or balcony it should be placed as close as possible to a strong supporting pillar or column.

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LEVELING:

The machine is provided with four bolt holes one at each corner of the base. Steel wedges or steel plates should be used for leveling. A good machinist's level should be used in the leveling process and the bubble should have adequate time to come to rest. The level should be placed both lengthwise and crosswise on the machine table.

VERTICAL HEAD ON OVERARM: (EXPORT ONLY)

When the machine leaves the factory the vertical head is positioned on the overarm with the spindle up and the motor down. Before operating the machine it is necessary that the head be returned to its normal operationing position by loosening the hexagonal units located at the head end of the overarm. It will then be possible to tilt the head into normal operating position by using a crank on the 1/2" stud located on the right side of the front end of the overarm. Because of the heavy overhung weight involved, the tilting of the head back to its normal position will be greatly facilitated if a second person can help push it into position. The head may then be trammed in as described.

VERTICAL HEAD ON OVERARM:

When the machine leaves the factory the vertical head is tilted back on the overarm. Before operating the machine it is necessary that the head be returned to its normal operating position and trammed in as described.

HANDLES:

When crating, the three ball crank handles are turned facing each other. The handles should be reversed during installation.

LUBRICATION:

Do not operate machine until properly lubricated. Follow the instructions given in fig. 3, Page 6, and Lubrication plate, Page 7.

INSPECTION:

Machine is carefully inspected and lined up before it leaves our factory. Figures # 1 and 2 shows the way your machine is lined up.

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ALIGNMENT OF HEAD

In case of precision boring or work of that nature, where it is necessary to have head perfectly square with the table, use method prescribed below. For normal milling, graduations on turret, and head are accurate enough. To set head perfectly square with table see Figures = 1 & 2. This may be done with head and adapter on overarm, by adjusting adapter through worm gear on adapter. Loosen three binding bolts but leave drag on same for fine adjustment. Mount indicator in spindle nose as shown in Figure # 1 and 2, and indicate parallel.

NOTE: When indicating as in Figures 1, it should be noted that the table is fitted to be slightly high in front, usually about .0005.

TABLE SQUARE WITH SPINDLE THRU
TRANSVERSE AXIS

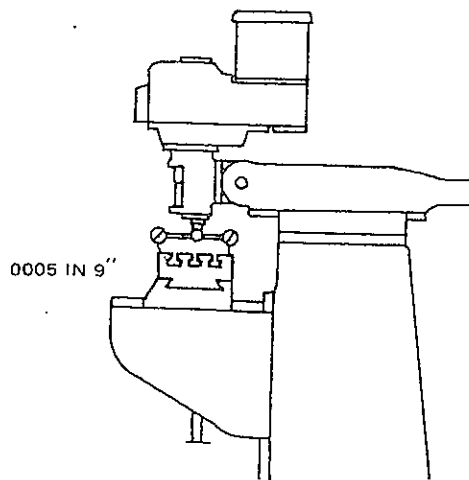


Fig. 1

TABLE SQUARE WITH SPINDLE THRU
LONGITUDINAL AXIS

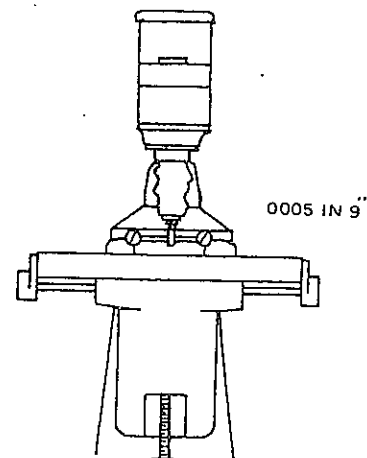


Fig. 2

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FOR CORRECT LUBRICATION WE RECOMMEND THE FOLLOWING
MOBIL PRODUCTS OR THEIR EQUIVALENT

VERTICAL SPINDLE BEARINGS	MOBILTEMP SHC 32
VERTICAL SPINDLE POWER FEED GEAR BOX	MOBILPLEX 45
PULLEY BEARINGS, TABLE LEAD SCREW BEARINGS & KNEE ELEVATOR THRUST BEARINGS	MOBILUX EP 2
KNEE ELEVATOR BEVEL GEARS	MOBILUX EP 2
VERTICAL SPINDLE OIL CUP CRANKSHAFT BEARINGS, WAYS, SLIDES, SPINDLE QUILL TRIP MECHANISM & AUTOMATIC LUBRICATOR	MOBIL VACTRA OIL No. 2
ELEVATING SCREWS & SPINDLE SPLINES	MOBILUX EP 2
OVERARM ARBOR SUPPORT	MOBIL VACTRA OIL No. 4

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ADJUSTMENT OF TABLE GIB

The table is provided with a full length tapered gib in the saddle, with an adjusting screw on the left side. To take up gib, tighten large screw slightly and repeat until a slight drag is felt when moving the table by hand. (Fig. 4)

Fig. 4

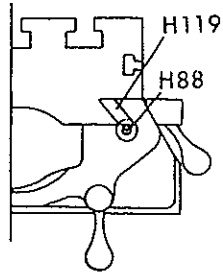
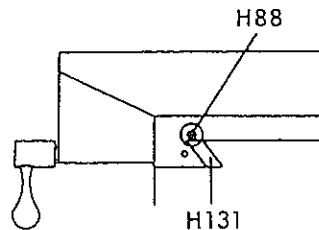


Table-saddle gib

ADJUSTMENT OF SADDLE AND KNEE GIBS

A tapered gib is used for adjusting the saddle bearing on the knee. This forms a guide for the saddle. To tighten gib same principal as described above is used; however, chip wiper must be removed first. (Fig. 5)

Fig. 5

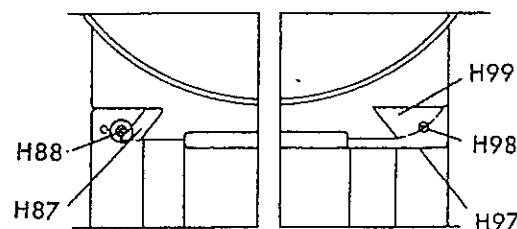


Saddle-knee gib

ADJUSTMENT OF KNEE GIB

Remove chip wiper and adjust screw until smooth movement is attained. (Fig. 6)

Fig. 6



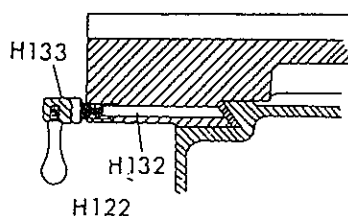
Knee-Column gib

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CLAMPING TABLE SADDLE

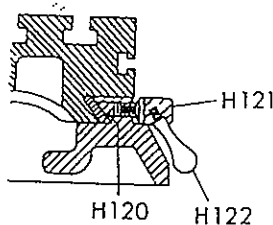
When milling with longitudinal table feed only, it is advisable to clamp the knee to the column and the saddle to the knee to add rigidity to these members and provide for heavier cuts with a minimum of vibration. The saddle locking lever is located on the left-hand side of saddle. (Fig. 7) Excessive Pressure can cause slight table bind. Use moderate clamping pressure, as this will hold saddle sufficiently.

Fig. 7



The table clamping levers are located on front of saddle and should always be clamped when longitudinal movement is not required. (Fig. 8)

Fig. 8



REMOVING OF TABLE

Remove as follows: Ball crank handles, dial holders, bearing brackets. Screw will then turn all the way so that it can be removed. When this is accomplished, the table can easily be taken off merely by sliding from saddle.

REMOVING OF SADDLE

Follows along the same lines as removing table; however, it is necessary to remove entire front bracket assembly completely. Then remove nut bracket which has become accessible after table has been removed.

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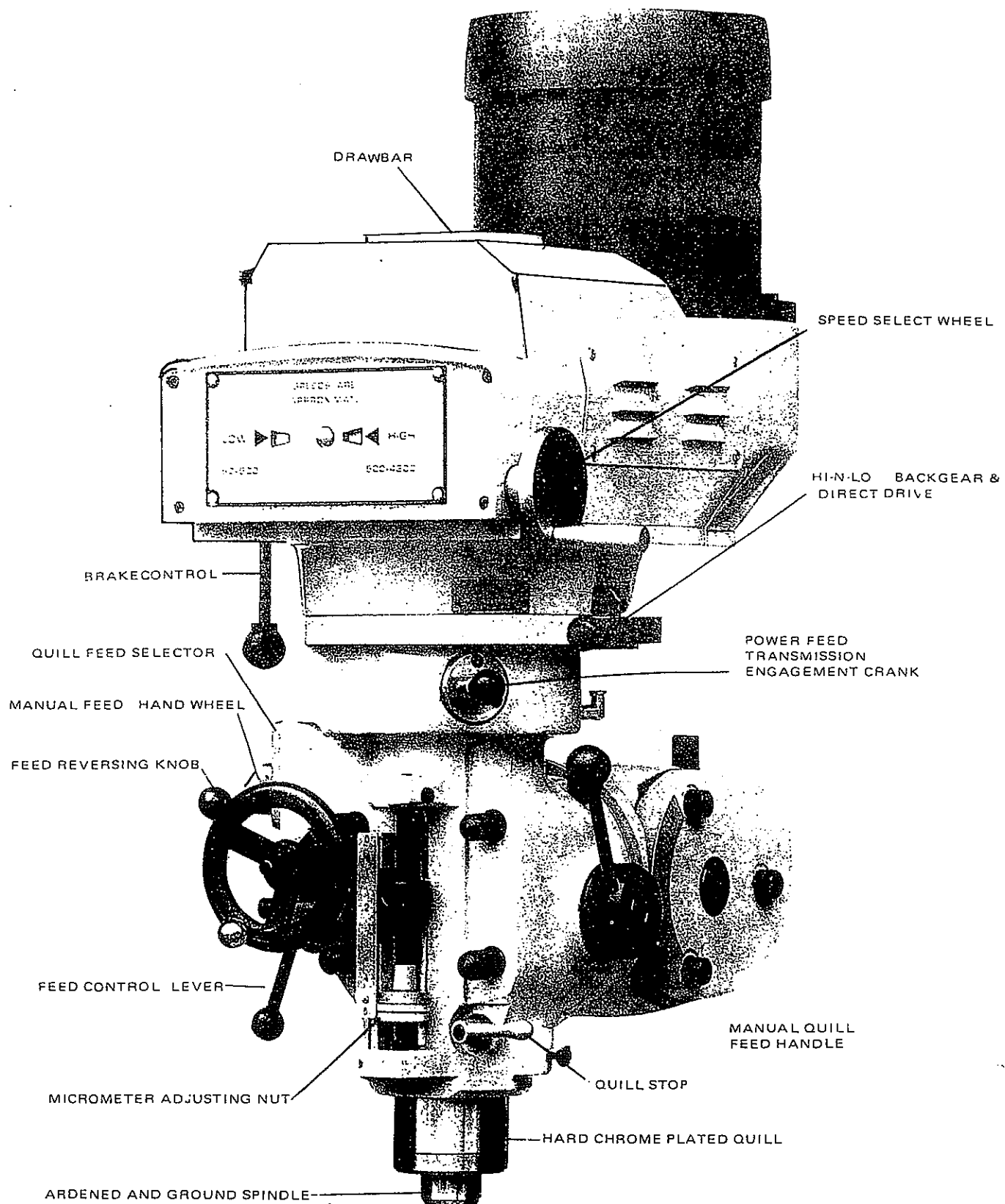


Fig. 9

INSTRUCTION MANUAL

INSTALLATION

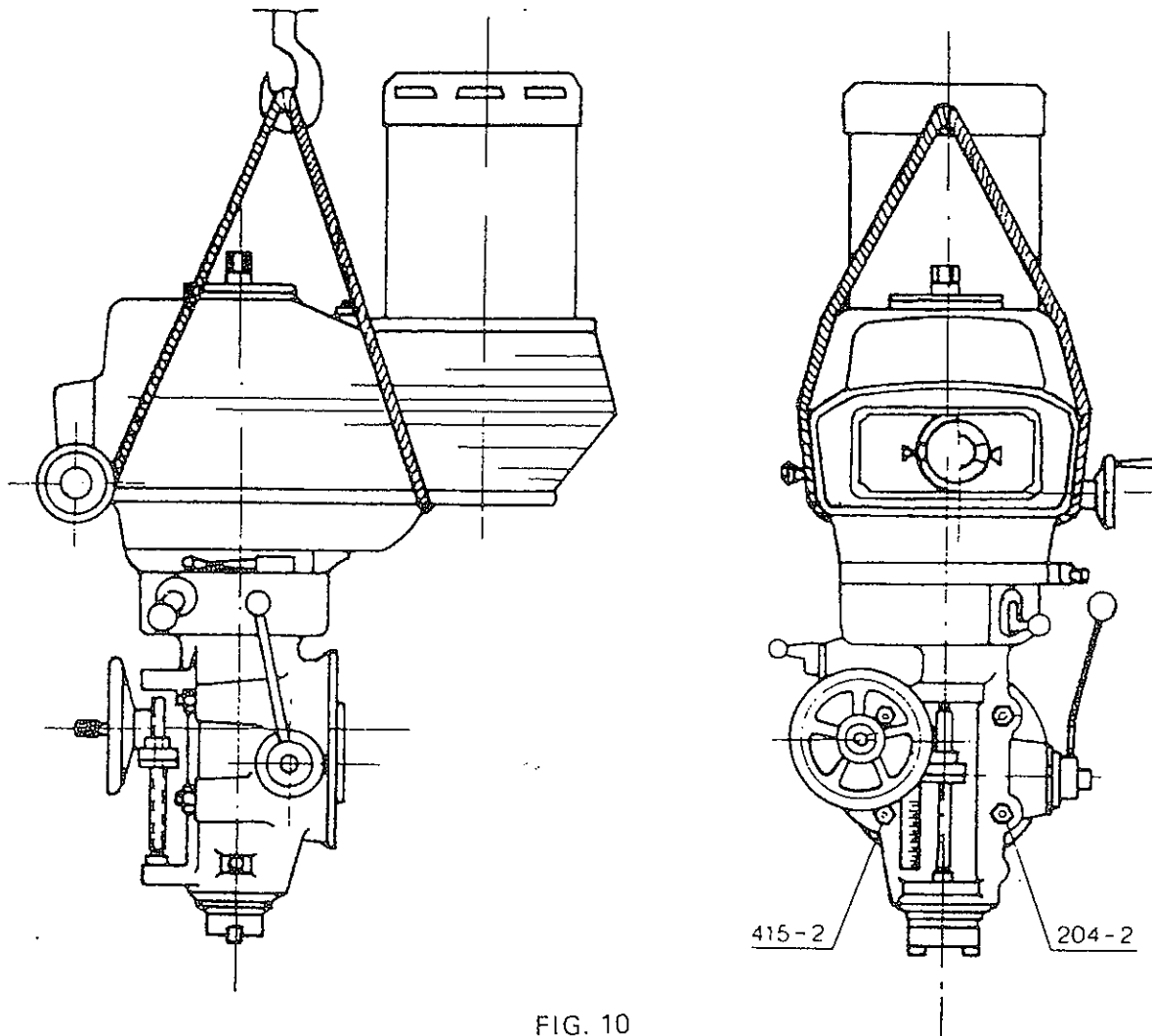


FIG. 10

HEAD REMOVAL/INSTALLATION

We recommend use of a nylon strap for transporting variable speed head, as shown above.

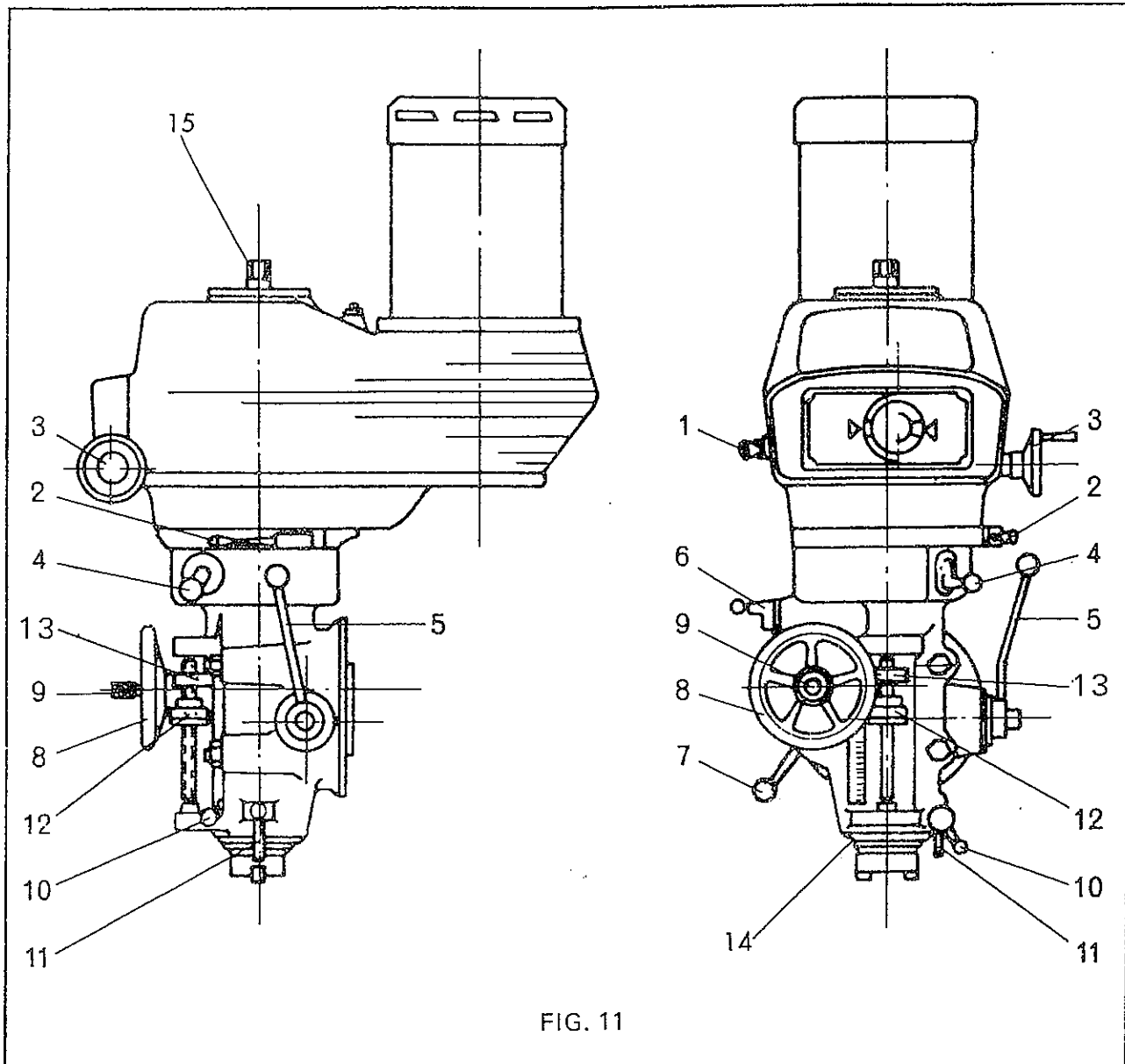
INSTALLATION

Place screws Nos. 204-2 and 415-2 into the four holes of head. Then, tighten by means of four nuts corresponding to screws mentioned above.

CAUTION: OVER TIGHTENING THE NUTS COULD CAUSE DAMAGE TO THE HEAD OR STRIP THE BOLTS.

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GENERAL DESCRIPTION OF VARIABLE SPEED HEAD



1. Brake Control.
2. Speed Range Selection Lever.
3. Speed Selection Handwheel.
4. Power Feed Transmission Engagement Lever.
5. Quill Feed Handle.
6. Quill Feed Selector.
7. Quill Feed Control Lever.
8. Hand Wheel for Manual Feed (by hand) of Quill.
9. Quill Feed Reversing Knob.
10. Quill Lock
11. Indicator Mounting Rod.
12. Adjustable Micrometer Depth Stop.
13. Quill Stop.
14. Quill
15. Draw Bar

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CAUTION: DO NOT ATTEMPT TO CHANGE (SPINDLE) R.P.M.'S WHILE SPINDLE MOTOR IS NOT RUNNING.

SPINDLE SPEEDS (R.P.M.'S) marked on the dial are approximate. Spindle speed (R.P.M.'S) are changed by turning handwheel (No. 3 fig. 11) located on the right side of head. Rotating this hand wheel in the clockwise direction will increase spindle speed (R.P.M.'S). Rotating this handwheel in the counter-clockwise direction will lower spindle speed (R.P.M.'S)

CAUTION: DO NOT ATTEMPT TO CHANGE SPINDLE SPEEDS (R.P.M.'S) UNLESS SPINDLE MOTOR IS RUNNING. THIS IS IMPORTANT AS ATTEMPTING TO CHANGE WHILE SPINDLE MOTOR IS NOT RUNNING WILL DAMAGE THE MECHANISM.

DRAWBAR (fig. 9) (Manual draw bar only)

Use spindle brake to restrict spindle rotation when Tightening or loosening drawbar.

1. To install collet or tool holder in spindle-first remove drawbar by pulling it out os spindle from top. Then place collet or tool holder into spindle. Put drawbar back into spindle and tighten into collet or tool holder, using discretion.

2. To remove tool from spindle-loosen draw bar 3 or 4 turns and tap on top of draw bar to free tool.

CAUTION: DO NOT LOOSEN DRAWBAR LESS THAN 3 TURNS OR MORE THAN 5 TURNS WHEN REMOVING TOOL. IF DRAWBAR IS TOO LOOSE THE THREADS MAY BE STRIPPED WHEN TAPPING ON END.

SPINDLE BRAKE

For Spindle Braking (Spindle motor in the off position only) use brake lever (No. 1 fig. 11) located on the left side of head moving Forward/Backward to stop a coasting spindle.

CAUTION: BE SURE THAT MANUAL BRAKE IS DISENGAGED BEFORE ATTEMPTING TO START SPINDLE MOTOR. This is very important, as failure to disengage brake may damage the motor on variable speed belt as well as other parts.

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SELECTION OF HIGH AND LOW RANGES (Direct Drive (High), Back gear (Low), (This lever has three position high, neutral, low) Range Selection (High or low) is obtained by lever (No. 2 fig. 11) located on the right side of head. Forward position of this lever is High range. (500 to 4200 R.P.M.'S) Rear position of this lever is low range (60 to 500 R.P.M.'S).

NOTE: 1 Because of back gear construction, when machine is running in low speed range spindle rotation is opposite to that of high speed range. Therefore, forward on reversing switch becomes reverse when in low speed range.

NOTE: 2 When shifting from NEUTRAL to HIGH or LOW, turn spindle by hand while pushing back gear lever into position. This allows gears to line up in low speed and dog clutch to line up in high speed.

NOTE: 3 The head has a neutral position to allow free rotation of the spindle for traming, positioning and inspection operations, etc.

CAUTION: DO NOT TO ATTEMPT TO CHANGE HIGH AND LOW RANGES WHILE SPINDLE MOTOR IS RUNNING.

NOTE: Do not change speed range (High-Low) when spindle automatic quill feed is engaged (No. 4 fig. 11).

POWER FEED TRANSMISSION ENGAGEMENT

The Power Feed Engagement lever (No. 4 fig. 11) is located directly below back gear lever. This lever has 2 positions; "IN", to engage spindle power feed transmission and "OUT" to disengage spindle power feed transmission.

CAUTION: ALWAYS BE SURE SPINDLE MOTOR IS STOPPED BEFORE ATTEMPTING TO MOVE THIS LEVER TO THE "IN" OR ENGAGED POSITION.

NOTE: Disengage spindle power feed transmission. When it is not being used. This will stop unnecessary wear on power feed worm gear.

CAUTION: DO NOT USE THE POWER FEED SYSTEM AT SPEEDS (R.P.M.'S) HIGHER THAN 3000 R.P.M.

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QUILL (NO. 14 fig. 11)

1. The quill may be locked in a given vertical location by turning the quill lock in a clockwise direction. Lever is located at the bottom of right side of head.

CAUTION: DO NOT ENGAGE QUILL FEED WITH QUILL-LOCK LEVER FULLY TIGHTENED.

2. The quill (or spindle) hand feed lever (No. 5 fig. 11) can be adjusted to any one of several operating positions by moving outwards (To the right on the lever hub and rotating to desired position. The hand feed lever can be pulled off when not in use.

3. Any one of three power feeds (in either an upward or downward direction) may be selected by moving the feed shift lever, located on right side of head, to the desired feed (0015, .003, 0008) per spindle revolution. If power feed is not being used it is wise to place (NO. 4 fig. 11) in the disengagement position. It may be some what easier to change the position of (No. 6 fig. 11) Quill feed selector when the spindle is rotating.

4. The fine feed handwheel (No. 8 fig. 11) is placed in operation condition by locating the feed transmission engagement lever in the (No. 4 fig. 11) "OUT" (disengaged) position and engaging the feed control lever (No. 7 fig. 11) the fine feed handwheel is held on by a spring plnnger and can be pulled off when not in use.

5. The knob on the shaft located in the center of the feed handwheel (NO. 8 fig. 11) is used to select downfeed (Pushed-in position), neutral (mid-position) or upfeed (pulled-out position) for either the power feed or the hand wheel feed.

6. Micrometer depth stop (No. 12 fig. 11) is used for setting of depths. Each graduation on nut indicates .001" of depth, it reads directly to scale mounted along side of it. Depths may be obtained by setting micrometer nut in conjunction with quill stop.

NOTE: Position noted are for clockwise rotation of spindle. Counter clockwise rotation reverses these position.

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HEAD

1. Tilting of the head in a front to back plane is readily accomplished by loosening the three nuts at the right hand side of the head (at joint) and applying crank to Forward head tilting worm stud (top center of joint).

CAUTION: WHEN RETURNING HEAD TO VERTICAL POSITION, SWEEP THE TABLE WITH AN INDICATOR ATTACHED TO SPINDLE TO MAKE SURE HEAD IS SQUARE TO TABLE.

2. To tilt head from side to side, loosen the (4) hex nuts (front of head). Then tilt head the desired amount by applying crank to the sidewise tilting worm stud located at the right side of joint and to the rear of the spindle head.

CAUTION: WHEN RETURNING HEAD TO VERTICAL POSITION, SWEEP THE TABLE WITH AN INDICATOR ATTACHED TO SPINDLE TO MAKE SURE HEAD IS SQUARE TO TABLE.

OVERARM OR RAM

The back to front position of the head and overarm is readily changed by loosening the 2 overarm locks (located left side of turret). Move the overarm by adjustment handle (located on right side of turret). To desired position.

TURRET

To Index the entire turret-overarm-head assembly loosen the 4 hex nuts, 2 on either side of the overarm which clamp the turret to the top of the column. Then swing the turret to the desired position and reclamp.

NOTE: It is highly recommended that all clamping nuts bolts and locks (Turret to column, overarm to turret, head side-wise tilt and head forward-back tilt) be securely tightened before any machining cuts are taken. Always check these points before starting a cut. Also, when returning overarm to normal position attach an indicator to the overarm, and slide the overarm in and out, with the indicator riding against a square which has been squared to front of table to make sure overarm is square with table.

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INSPECTIONS:

1. Inspect taper of spindle for cleanliness and freedom from chips of foreign matter. Frequency-Each time tool holder is inserted.

Inspection by machine operator.

No special equipment required.

2. Inspect and adjust gibs of slide ways.

Frequency-every 160 hours. Oftener if looseness is noted by operator. Inspection and adjustment by machine operator or machine maintenance man. No special equipment required other than allen wrench.

3. Inspect for general cleanliness of machine, paying particular attention to keep dirt and chips from slide ways. DO NOT USE AIR TO REMOVE SUCH DIRT AND CHIPS-- BUT WIPE OFF WAYS OR KEEP THEM COVERED. Flood ways with light oil and work slide movements back and forth to wash out foreign matter. Then re-lubricate machine according to lubrication instructions.

Frequency-Constantly, as far as wiping off chips and dirt are concerned. Every 40 hours ways should be flooded with oil and cleaned as above. No special equipment required.

4. Inspect drive belts for wear, hard spots at splice etc.

Frequency-Every 40 hours.

Inspection by machine operator or machine maintenance man.

No special equipment required.

5. Inspect to see if vertical head is square with table, by mounting indicator on spindle and sweeping table.

Frequency-every 80-120 hours, or after head has been tilted.

Inspection by machine operator or machine maintenance man.

Special equipment required consists of (1) A short accurate arbor to insert in spindle. (2) A clamp for use in clamping a 6" bar to above arbor in a horizontal position. (3) 6" bar approximately 1/2" in diameter. (4) An accurate dial indicator to clamp to above 6" bar in position so when spindle is revolved by hand, nib of indicator in contact with table, sweeps table in a full circle and indicates out of squareness.

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NOTE: Table is intentionally left .0005" high in front. This will gradually decrease as machine is used.

6. Inspect electrical equipment.

Frequency-In accordance with standard plant policy.

Inspection by machine maintenance man.

No special equipment required.

PARTS REPLACEMENT:

None except as indicated by wear or malfunction.

Frequency or replacement only as above.

LUBRICATION - (See Lubrication Sheet Page 7)

TROUBLE SHOOTING

NOTE: Ordinarily trouble will not manifest itself except when actually working machine.

1. Slide ways working hard or binding.

- a. Cause-gibs out of adjustment, either too tight or too loose. in latter case causing gib to "wedge".

Remedy-Adjust gibs.

- b. Cause-Dirt in slide ways.

Remedy-Wash out slide ways with light oil.

CHATTER OR VIBRATION WHEN CUTTING.

- a. Cause-Dirt in spindle taper, causing bad fit between tool holder shank and spindle taper.

Remedy-Clean spindle taper and shank of tool holder.

- b. Cause-Faulty shank on tool holder.

Remedy-Replace shank or dress off burrs, if due to nicks or burrs.

- c. Gibs poorly adjusted on slide ways, or dirtly.

Remedy-Adjust gibs

- d. Work improperly clamped to table of machine.

Remedy-Check for rocking or movement, and correct by proper clamping.

- e. Improper grind on cutting tool.

Remedy-Replace or re-grind tool.

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- f. Hard spot at splice of drive belts or worm belts.
Remedy-Replace belts.
- g. Spindle quill worn in quill head lock slightly.
Remedy-Tighten quill head lock slightly.
- h. Incorrect spindle speed, table feed, or both.
Remedy-Ordinarily increase spindle speed and/or increase or decrease feed to break up vibration period. Experiment by using hand feed to feed table.

BORING OR MILLING OUT SQUARE OR AT AN ANGLE.

- a. Cause-Head not properly aligned with table.
Remedy-Check head for alignment and correct.
- b. Work improperly set up; i.e. not square and flat.
Remedy-Check and re-align work.

FAILURE TO HOLD CENTER DISTANCE WHEN LOCATING FOR BORING.

Cause-Failure to take back-off tension on lead screw after coming up to indicator reading, causing table to "creep", or failure to lock up slide ways with same amount of tension tension after moving table to new position.

SPARE PARTS RECOMMENDED

SET OF DRIVE BELTS FOR ALL DRIVES: (See Parts List)

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GENERAL SPEED RECOMMENDATIONS

Material to be Cut	Feet Per Minute		
	Rough Cut	Rough and Finish	Light and Finish Cut
Cast Iron-Soft-(Under 200 Brinnell)	70	80-90	120
Cast Iron-Med.-(200-300 Brinnell)	55	60-70	90
Cast Iron-Hard-(Over 200 Brinnell)	40	50-60	70
Steel (Chrome Nickel 40-45 Shore)	30	40	50
Steel (Stainless)	60	80	90
Steel (Low Carbon)	80	90	140
Steel (High Carbon)	40	50	70
Bronze (Medium)	90	120	150
Bronze (Hard)	65	90	130
Brass (Hard)	100	150	200
Copper	150	200	300
Duraluminum	400		600
Aluminum	600		1000

TABLE OF CUTTING SPEEDS AND FEEDS

Feet Per Minute	15	20	25	30	40	50	60	70	80	90	100
Diameter, Inches	Revolutions Per Minute										
1/16"	917	1222	1528	1833	2445	3056	3667	4278	4889	5500	6112
1/8"	458	611	764	917	1222	1528	1833	2139	2445	2750	3056
3/16"	306	407	509	611	815	1019	1222	1426	1630	1833	2037
1/4"	229	306	382	458	611	764	917	1070	1375	1375	1528
5/16"	183	244	306	367	489	611	733	856	978	1100	1222
3/8"	153	204	255	306	407	509	611	713	815	917	1019
7/16"	131	175	218	262	349	437	524	611	698	786	873
1/2"	115	153	191	229	306	382	458	535	611	688	764
5/8"	91	122	153	183	244	306	367	428	489	550	611
3/4"	76	102	127	153	204	255	306	357	407	458	509
7/8"	65	87	109	131	175	218	262	306	349	393	437
1"	57	76	95	115	153	191	229	267	306	344	382
1 1/8"	50	67	84	102	136	170	204	238	272	306	340
1 1/4"	45	61	76	91	122	153	183	214	244	275	306
1 3/8"	41	55	69	83	111	139	167	194	222	250	278
1 1/2"	38	50	63	76	102	127	153	178	204	229	255
1 5/8"	35	47	58	70	94	118	141	165	188	212	235
1 3/4"	32	43	54	65	87	109	131	153	175	196	218
1 7/8"	30	40	50	61	81	102	122	143	163	183	204
2"	28	38	47	57	76	95	115	134	153	172	191

The foregoing should be regarded as approximate, as many factors control the efficient operation of end mills. Always keep cutters sharp, and a steady flow of oil or compound directly on the working point will allow much higher cutting speed. Keep rate of feed consistent with finish required.

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INSTRUCTIONS FOR REPLACEMENTS

Motor replacement

1. Set spindle speed at its lowest point, for high-speeds as well as for low-speed range. Motor pulleys are in the most adequate position to dismantling of motor. Remove power from the lines.

2. Then, Unfasten lower back cover (No. 705) and take it off.

By means of screws (No. 847) lock sliding pulley of motor shaft (No. 709) with the spring holder washer. Fit those screws into washer holes and screw them to the pulley, until fastening elastic washer (No. 849) is free.

After performing previous operation, bring speed plate to the point of highest revolutions (according to range); this will loosen the belt and will make easier the subsequent operation.

3. Now, unfasten both screws (No. 839) fixing the motor to the framework, and take off the fastening elastic washer from the inside pulley-spring assembly (No. 849) Then take the motor out from the pulley guard.

To install in the new motor, reverse above operation.

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REPLACEMENT OF VARIABLE SPEED BELT

- (1) With spindle motor running set R.P.M. to 4200 (Turn Spindle motor off)
- (2) Remove four No 10 x 20 1¼ hex head cap screws which hold the motor over the pulley guard.
- (3) Disassemble back cover below motor pulley.
- (4) Slide motor as far as possible toward the spindle and work the belt over the motor pulley.
- (5) Remove the motor from the pulley guard housing.
- (6) Dismantle upper cover of framework (No.725). Then, unfasten screws (No.833) fixing the balance beam No.718 and take out bushings (No.719.) Unfasten the six screws (No.876) fixing framework to check or gearbox. The framework is now fixed only by two locating pins, and it may come off with a light blow.
- (7) Change the variable transmission belt (No.830) for a new one, if possible of the same trademark.

IMPORTANT: The use of a defective or worn out belt may cause a vibration and an excessive temperature.

REPLACEMENT OF REDUCTION TIMING BELT (503)

1. Perform previous operations, as for changing the variable speed belt.
2. Take off the assembly formed by lower pulley and its support (No.703), by unfastening the six screws (No.853)

Once this assembly has been taken off, change the belt, we recommend that the belt should always be provided by BUFFALO MACHINERY.

IMPORTANT: All these replacement operations will be easier if the variable speed framework is separated from the head itself. For that purpose, unfasten the three nuts (No. 851) and remove variable speed framework.

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FINAL RECOMMENDATIONS

LUBRICATION

Long life, accuracy and warranty of this variable speed head are conditioned by an adequate use and lubrication. Therefore, please follow strictly the greasing indications shown on lubrication. Therefore, please follow strictly the greasing indications shown on lubrication plate, and avoiding the use of different lubricants.

Bearings in this assembly are watertight and are greased for life.

WORK

The feeds can be used to drill holes up to a 3/8" dia. Use manual feeds for holes that are larger than the mentioned one.

The clutch is adjusted to approx. 200 Lbs. of downwards pressure on the quill which allows drilling of 3/8" dia. in mild steel.

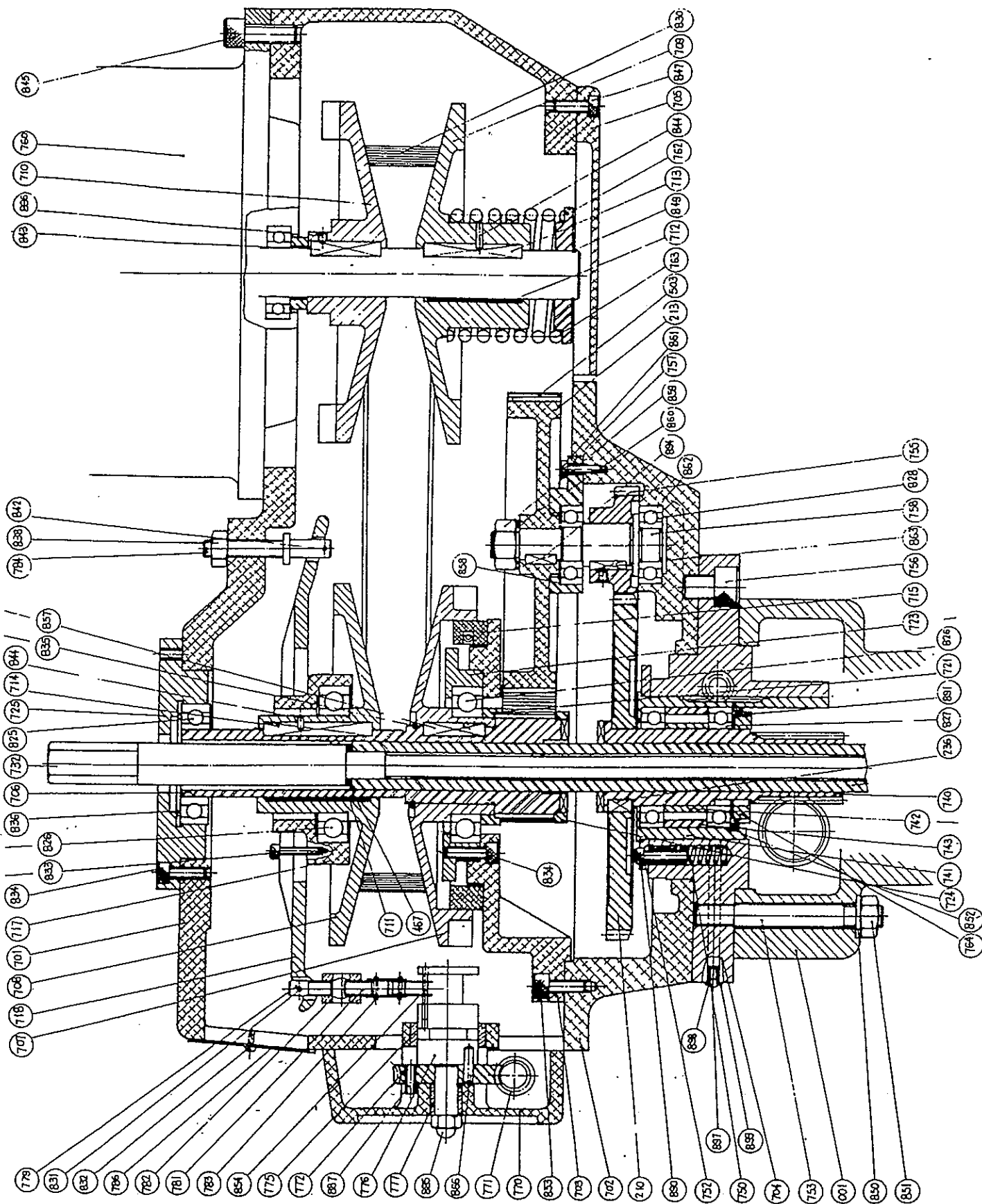
CAUTION: THIS CLUTCH IS TO BE USED ONLY WHEN IT IS ABSOLUTELY NECESSARY.

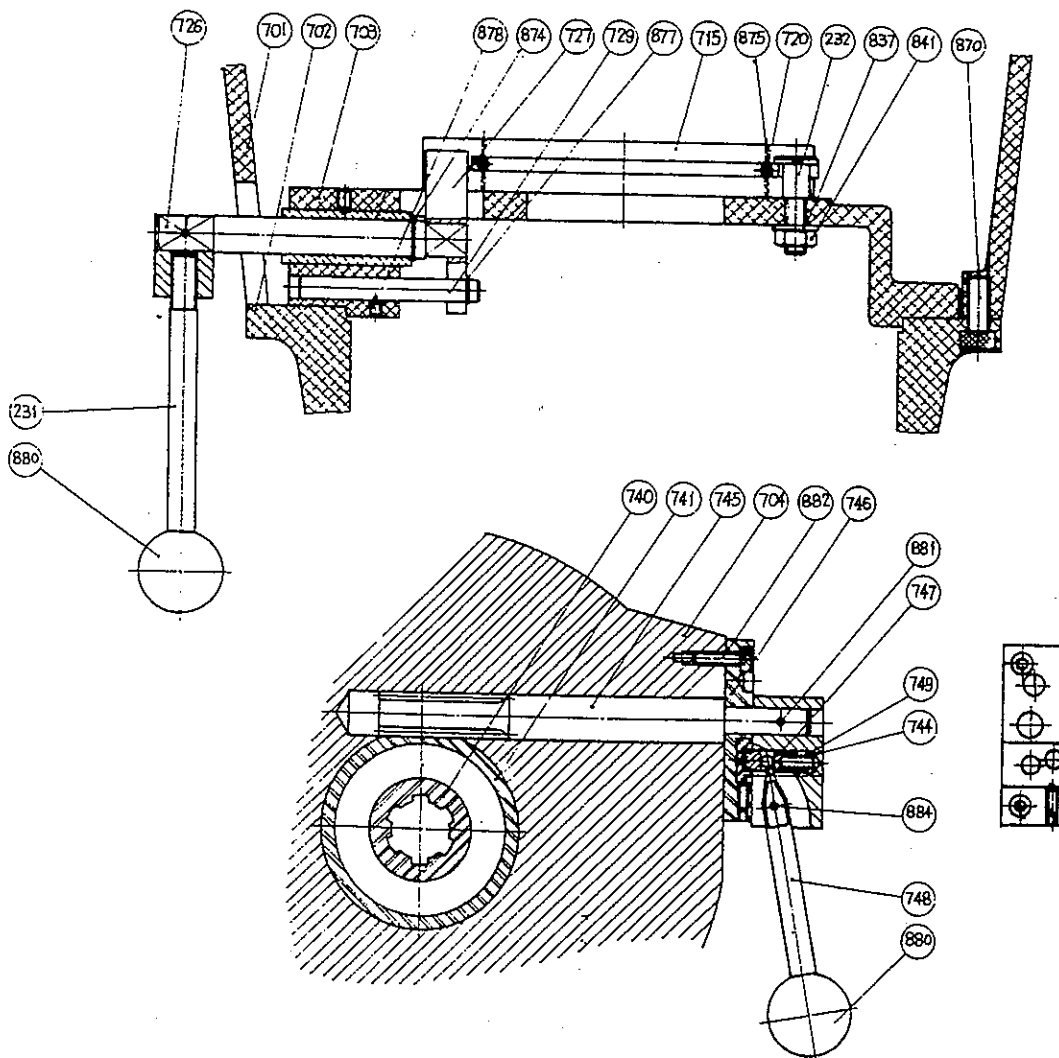
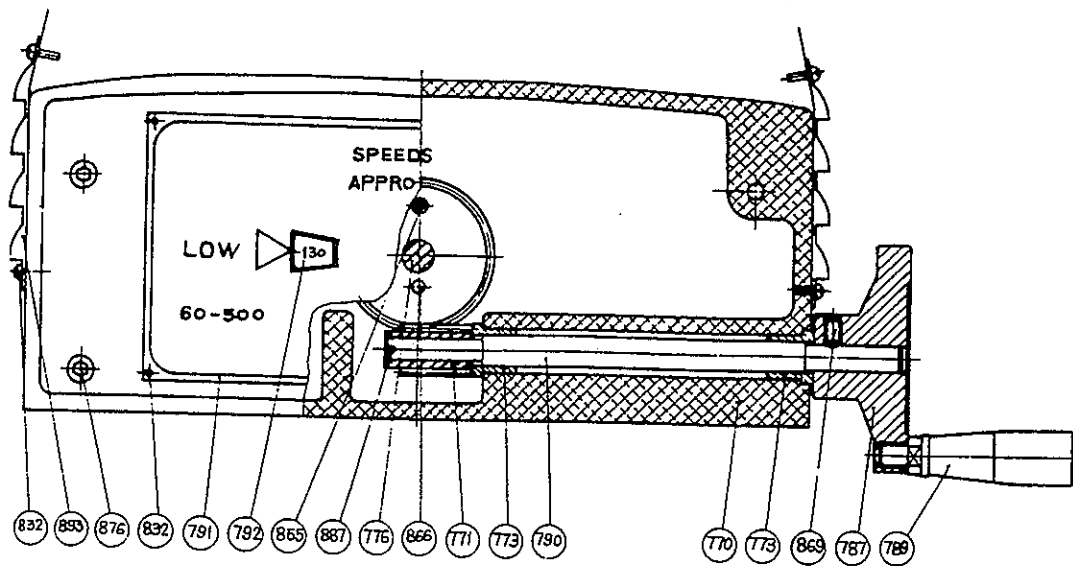
WARNING: IN HEAVY DUTY MILLING OPERATIONS, HOLD THE HEAD AS CLOSE TO THE COLUMN FACE AS POSSIBLE, IN ORDER TO OBTAIN A MAXIMUM RIGIDITY.

HIGH SPEED

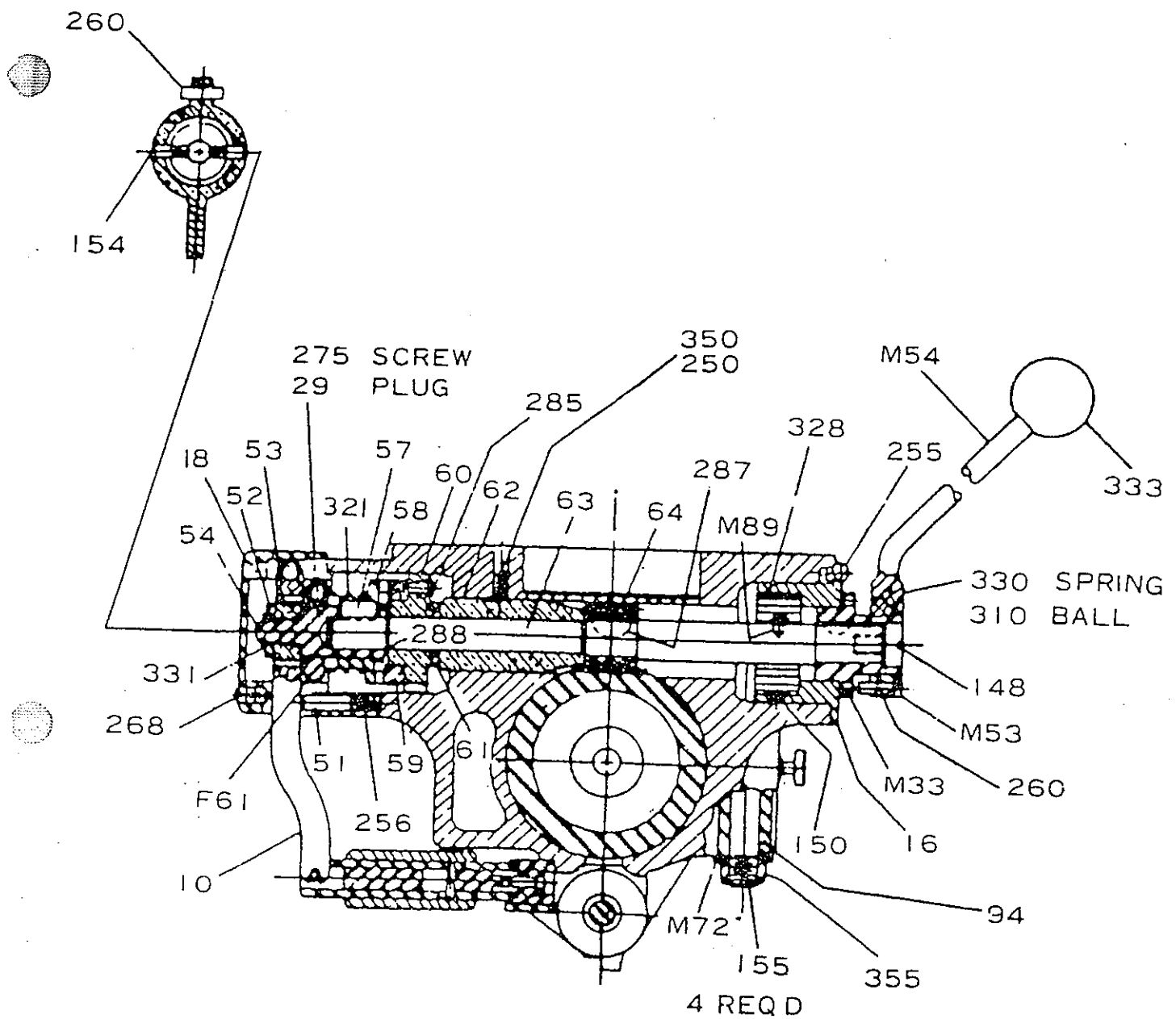
In high speed position, spindle is directly driven by means of a tapered tooth drive. If this clutch is not tightened enough, a light noise may be produced: this can be corrected by changing position of position plate No. 718 upwards, until noise disappears. When positioning plate has a long displacement, this operation needs to reverse this plate.

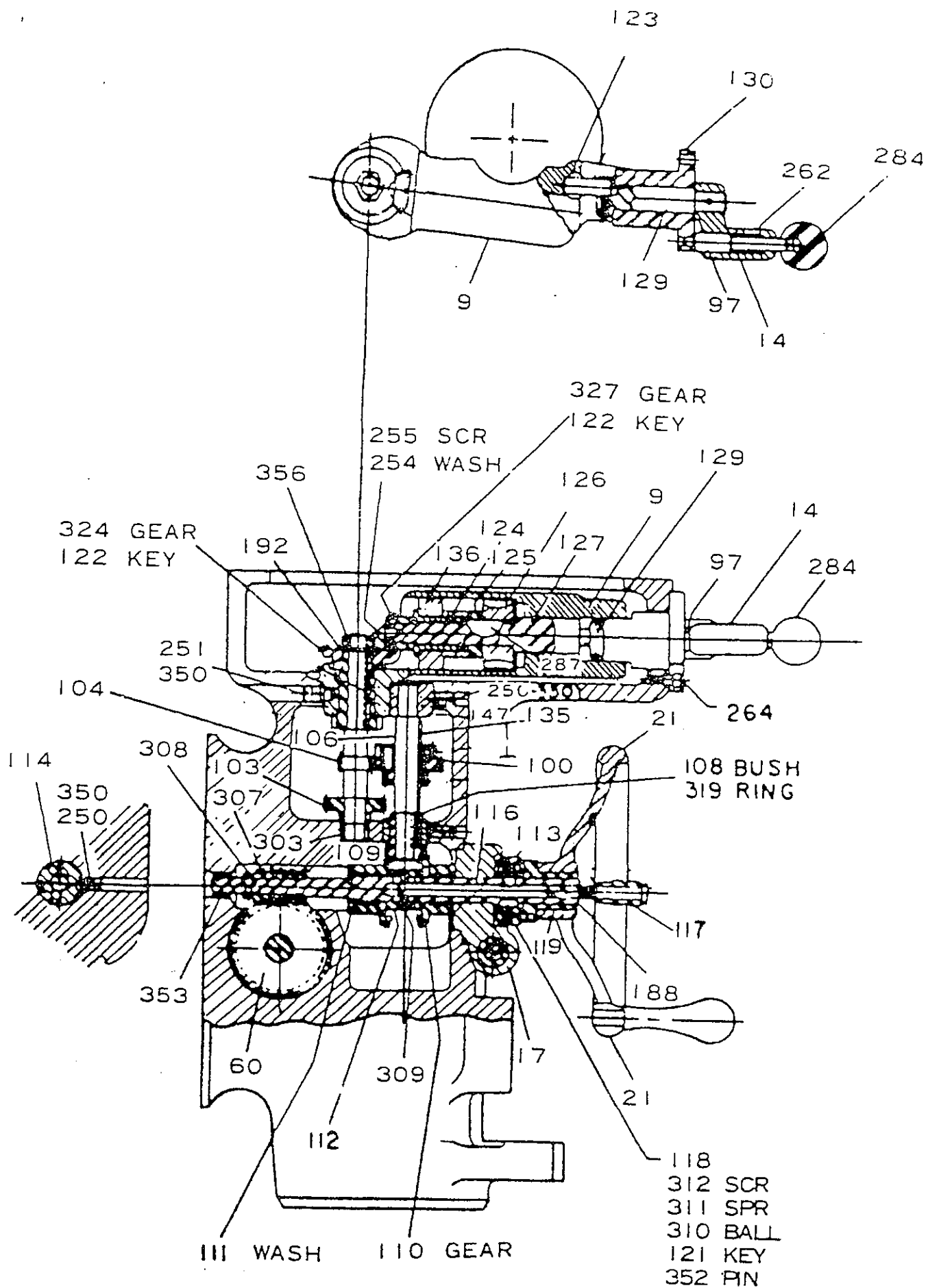
CAUTION. Do not change high and low speeds direct drive/BACKGEAR WHEN MOTOR IS RUNNING.

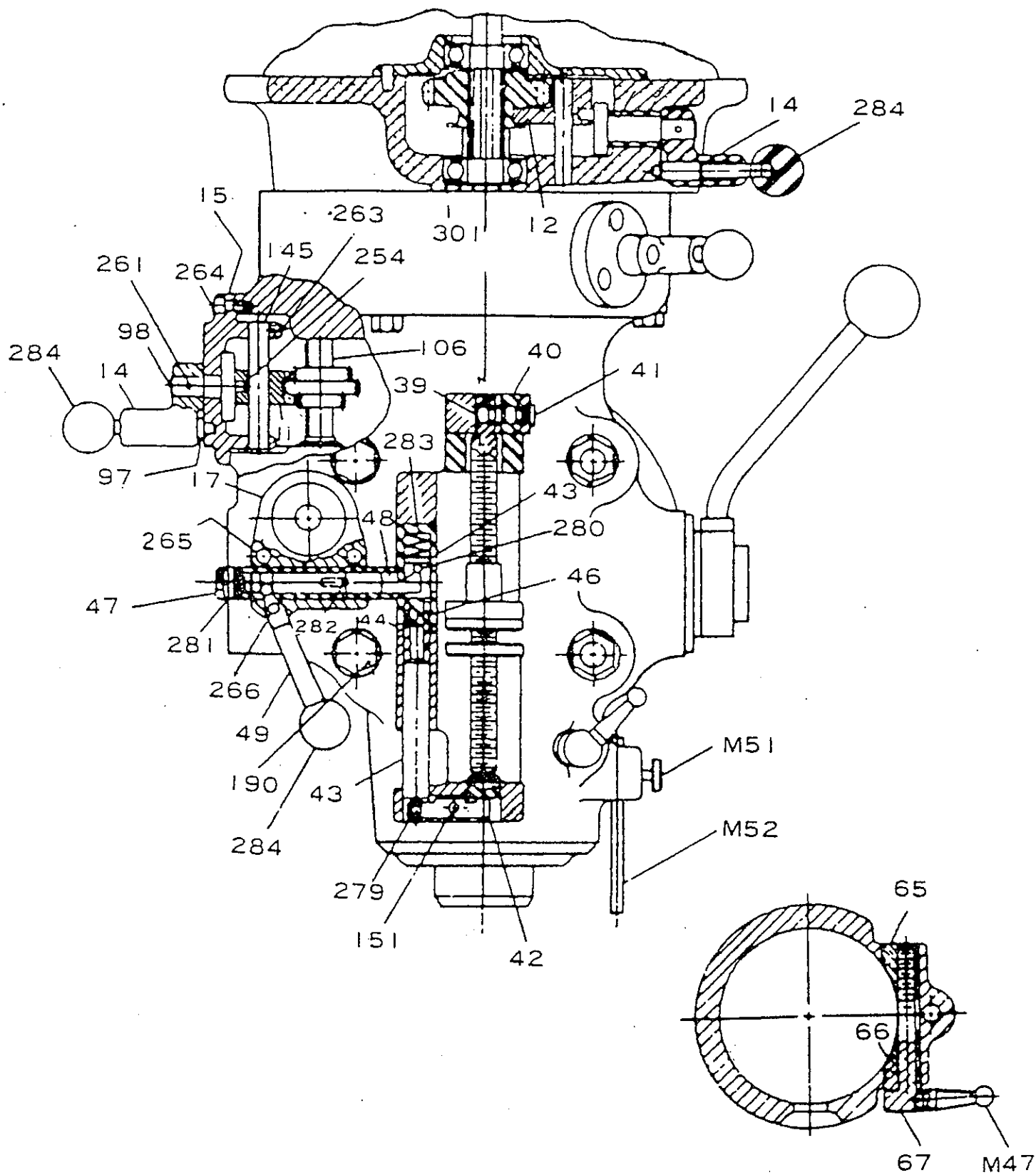


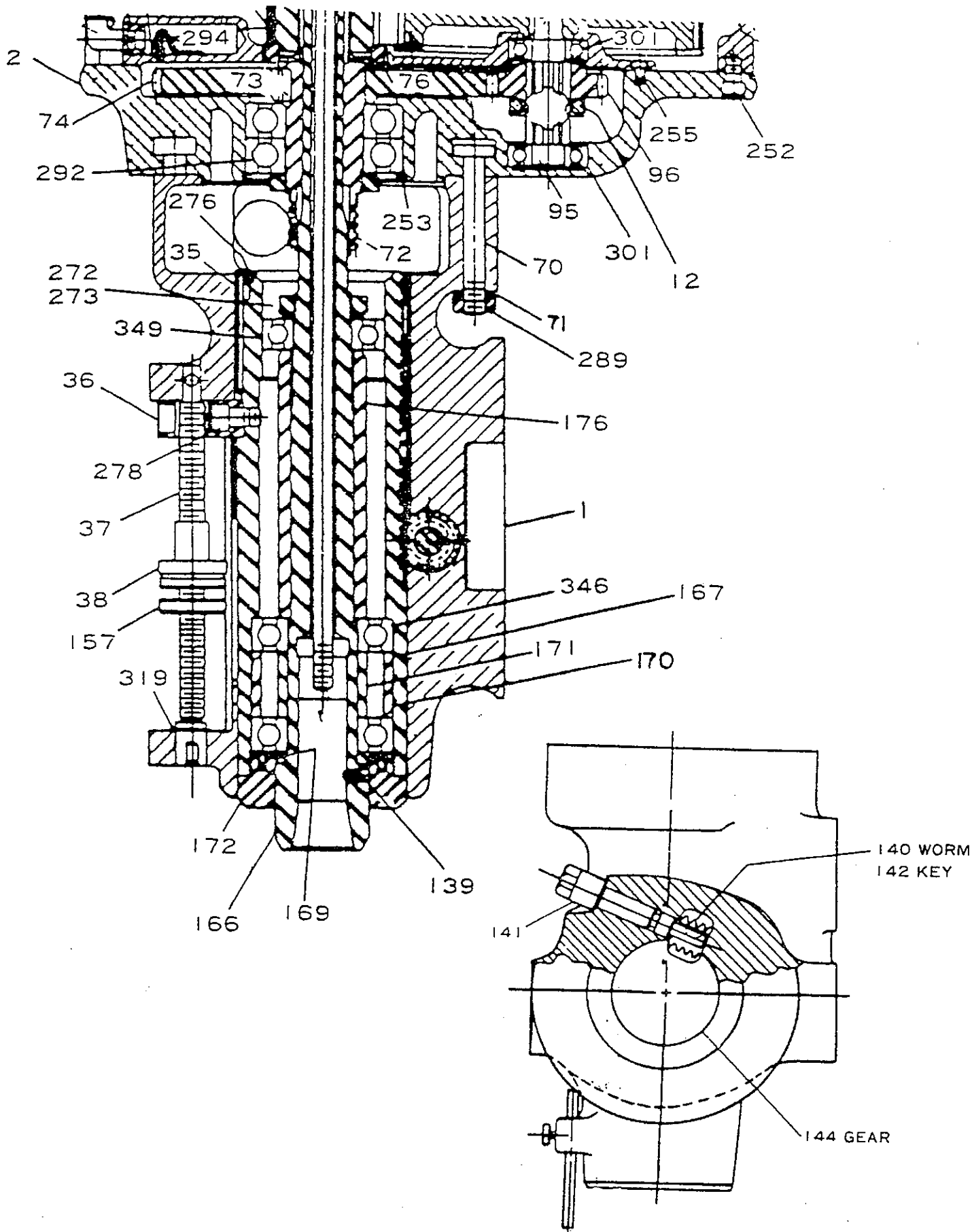


Vendor #	Part description	Milltronics Part #	Vendor#	Part Description	Milltronics Part #
JV-210	Spindle Bull Gear	MPM-27	JV-782	Regulating nut	
JV-213	Timing Belt Pulley	MPM-28	JV-783	Chain	
JV-213	Brake Lock and Handle	MPM-05	JV-784	Regulating Spindle	
JV-232	Brake Ring Screw		JV-786	Firm Plate	
JV-236	Bull Gear Key		JV-787	Handwheel	
JV-298	Set Screw		JV-788	Handwheel Hub	
JV-456	Lever Shaft		JV-789	Control Handle	
JV-467	Drawbar Washer		JV-790	Operating Shaft	
JV-949	Key	MHVS-312	JV-791	Speed plate	
JV-503	Timing Belt		JV-792	Speed disk	
JV-504	Gigs Oil Cup		JV-825	Bearing	
JV-565	Aluminum Elbow		JV-826	Bearing	BG-68
JV-701	Belts Cover		JV-827	Bearing	MHVS-384
JV-702	Gear Box		JV-828	Bearing	MHVS-385
JV-703	Main Spindle Support	MPZ-150	JV-829	Bearing	
JV-704	Support Plate		JV-830	Continen belt	
JV-705	Down Cover of Framework		JV-831	Elastic belt	
JV-706	Pulley Shaft Clutch	MHVS-313	JV-832	Phillips screws	
JV-707	Main Spindle Pulley	MHVS-314	JV-833	Allen screws	
JV-708	Main Sliding Pulley	MHVS-315	JV-834	Allen screws	
JV-709	Sliding motor pulley	MHVS-316	JV-835	Elastic ring	MHVS-392
JV-710	Fixed motor pulley	MHVS-317	JV-836	Way washer	
JV-711	Main pulley bushing	MPM-34	JV-837	Washer	MHVS-394
JV-712	Motor pulley bushing	MPM-35	JV-838	Nut	
JV-713	Motor shaft cotter	MPM-36	JV-839	Washer	
JV-714	Main spindle cotter	MPM-37	JV-840	Washer	
JV-715	Main spindle bracket	MHVS-321	JV-841	Nut	
JV-717	Drive pan		JV-842	Cotter pin	
JV-718	Balancing beam	MPM-39 ONLY(MHVS-323 WITH JV-720) MPM-60	JV-843	Cotter	MPM-68
JV-718	Balancing beam bushing	PART OF MHVS-323	JV-844	Allen setscrew	
JV-720	Traction springs	MHVS-325	JV-845	Allen screws	
JV-722	Pulley fastening		JV-846	Nut	
JV-723	Cove for main spindle bearing	MHVS-327	JV-847	Allen screws	
JV-724	Clutch ring	MHVS-328	JV-848	Wavy washer	
JV-725	Upper cover of framework	MPM-91	JV-849	Ring	
JV-726	Shaft for brake operation		JV-850	Washer	
JV-727	Brake cams		JV-851	Nut	
JV-729	Brake rotation bolt		JV-852	Elastic ring	MHVS-409
JV-730	Brake bushing		JV-853	Allen screws	
JV-731	Brake shaft bushing		JV-854	Elastic pin	
JV-732	Fastening draw bar		JV-855	Elastic pin	
JV-740	Two admission clutch	MHVS-336	JV-856	Elastic	
JV-741	Sliding bearing box	MHVS-337	JV-857	Cotter	
JV-742	Bushing	MHVS-338	JV-858	Wavy washer	MHVS-415
JV-743	Spacing bushing	MHVS-339	JV-859	Nut	
JV-744	Lever hub		JV-860	Washer	MHVS-417
JV-745	Tooth changing shaft	MPM-83/MHVS-341	JV-861	Hexagon -head screws	
JV-746	Rotation plate	MPM-84	JV-862	Allen Set screws	MHVS-419
JV-747	Locking nozzle		JV-863	Cotter	MHVS-420
JV-748	Control lever	MPM-41/ MPM-81	JV-865	Elastic pins	
JV-749	Spring		JV-866	Cotter (key)	
JV-750	Clutch spring	MPM-96	JV-867	Allen screws	
JV-751	Guideway flanges		JV-868	Elastic pin	
JV-752	Drive ring	MPM-95	JV-869	Allen screws	
JV-753	Pins		JV-870	Allen screws	
JV-754	Protecting sheet		JV-871	Spering	
JV-755	Driving gear	MPM-42	JV-872	Steel Ball	
JV-756	Square- Head screw		JV-873	Allen screws	
JV-757	Cover		JV-874	Elastic ring	
JV-758	Gear Shaft	MPM-43	JV-875	Elastic pins	
JV-760	Main motor		JV-876	Allen screws	
JV-761	Motor bushing		JV-877	Elastic	
JV-762	Spring Rest	MPS-597	JV-878	Allen screws	
JV-763	Operating spring	MPM-44	JV-879	Safety joints	
JV-764	Safety Nut	MHVS-359	JV-880	Knob	MPM-05
JV-770	Operating Support		JV-881	Tapered pin	
JV-771	Worm gear		JV-882	Allen screws	
JV-772	Gear		JV-884	Cylindrical pin	MPM-45/MPM-66
JV-773	Bushing		JV-885	Blind Nut	
JV-774	Bushing		JV-886	Screw	
JV-775	Operating Shaft Bushing		JV-887	Elastic pin	
JV-776	Operating Shaft		JV-888	Allen screws	
JV-777	Bushing		JV-889	Allen screws	
JV-778	Ring		JV-890	Shaft	
JV-779	Adjusting Spindle		JV-891	Washer	MHVS-446
JV-780	Metal Sheet of Air piping		JV-893	Screw	
JV-781	Pin		JV-894	Key	MHVS-448
			JV-895	Bearing spacer	



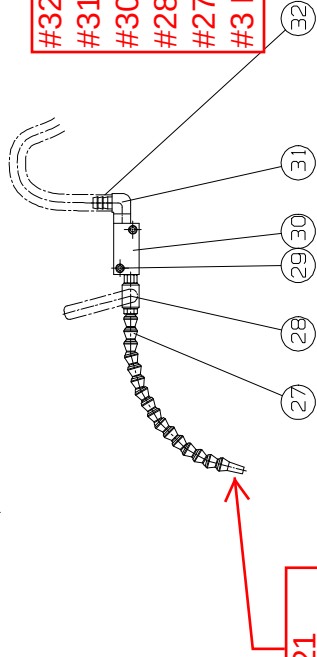






<u>Vendor #</u>	<u>Part description</u>	<u>Milltronics Part #</u>	<u>Vendor#</u>	<u>Part Description</u>	<u>Milltronics Part #</u>
J-1	Quill Housiong		J-65	Quill lock sleeve	MPM-71
J-2	Gear Housing		J-66	Quill lock sleeve	MPM-76
J-3	Gear housing cover		J-67	Quill lock bolt	
J-4	Belt housing		J-70	Vertical tee bolt	MHVS-513
J-5	Spindle pulley		J-71	Vertical tee bolt	
J-6	motor pulley		J-72	Splined gear hub	MP5-009
J-7	Timing belt pulley		J-73	Bull gear key	
J-8	Timing belt pulley flange		J-74	Spindle bull gear	
J-9	Worm gear cradle		J-75	Spindle pulley hub	
J-10	Overload clutch trip lever	MHVS-459	J-76	Pulley collar	
J-11	Feed gear shifter fork		J-77	Quilar tube	
J-12	Back gear shifter fork		J-78	Oil plug	
J-13	Spindle pulley bearing sleeve		J-79	Spindle pulley key	
J-14	Shift Crank		J-80	Upper bearing spacer - large	
J-15	Cluster gear cover		J-81	Upper bearing spacer - small	
J-16	Spring cover		J-82	Bearing sleeve locknut	
J-17	Feed trip bracket		J-83	Upper bearing locknut	
J-18	Clutch arm cover		J-84	Cam Ring	
J-19	Key		J-85	Spindle clutch lever	
J-20	Motor switch bracket		J-86	Spindle clutch cam ring pin	
J-21	Handwheel	MHVS-470	J-87	Brake block	
J-23	Feed retainer ring		J-88	Brake ring screw	
J-24	Microscrew jam nut		J-89	Brake lock stud	
J-27	Bearing spacer		M-89	Clockspring stud	
J-29	Spindle locknut binding		J-91	Brake lock washer	
J-33	Pinion shaft hub sleeve		J-92	Brake lock and handle	
J-34	Quill nosepiece		M-72	Nut	
J-35	Quill skirt	MHVS-477	J-93	Brake lock pin	
J-36	Quill stop knob	MHVS-478	J-94	Lower clamping bolt spacer	
J-37	Quill stop micro screw	MHVS-479	J-95	Countershaft	
J-38	Micrometer nut	MHVS-479 (set)	J-96	Countershaft gear	
J-39	Reverse trip ball lever	MPM-25	J-97	Gearshift plunger	
J-40	Feed reverse trip plunger	MPM-26	J-98	Cluster gear shift crank	
J-41	Reverse trip ball lever screw		J-100	Feed drive cluster gear - center	
J-42	Feed trip lever	MHVS-484	J-103	Gfeed drive gear	
J-43	Feed trip plunger	MPM-19	J-104	Cluster gear input shaft	MHVS-545
J-44	Trip plunger bushing	MHVS-486	J-106	Cluster gear shaft	
J-45	Trip plunger		J-108	Bevel gear bearing	
J-46	Feed trip plunger	MPM-79	J-109	Bevel gear thrust spacer	
J-47	Cam rod sleeve assembly	MPM-18	J-110	Feed reverse bevel gear	
J-48	Cam Rod	MPM-17	J-111	Feed worm shaft thrust washer	
J-49	Trip hand	MPM-16	J-112	Feed reverse bevel gear	
J-50	Locknut binding plug		J-113	Handwheel clutch spring screw	
J-51	Overload clutch lever spring plunger		J-114	Feed worm shaft bushing	
M-51	Indicator rod screw		J-116	Reverse clutch rod	
J-52	Overload clutch washer		J-117	Reverse knob	MHVS-555
M-52	Indicator rod		J-118	Handwheel clutch spring screw	
J-53	Clutch ring		J-119	Handwheel bushing	
M-53	Pinion shaft hub sleeve		J-121	Worm Shaft Key	MPM-15
J-54	Overload clutch sleeve		J-122	Feeding drive	
M-54	Pinion shaft hub wandle		J-124	Feed worm gear shaft sleeve	
J-57	Overload clutch sleeve key		J-125	Worm gear shaft	
J-58	Overload clutch		J-126	Feed drive worm gear	
J-59	Overload clutch ring	MHVS-503	J-127	Feed Drive worm gear	
J-60	Overload clutch worm gear		J-128	Feed Engage pin	
J-61	Overlaod clutch locknut		J-129	Worm gear cradle thrown out	
J-62	Quill pinion shaft bushing		J-130	Shifts sleeve	
J-63	Quill pinion shaft		J-131	Motor locknut	
J-64	Quill pinion				

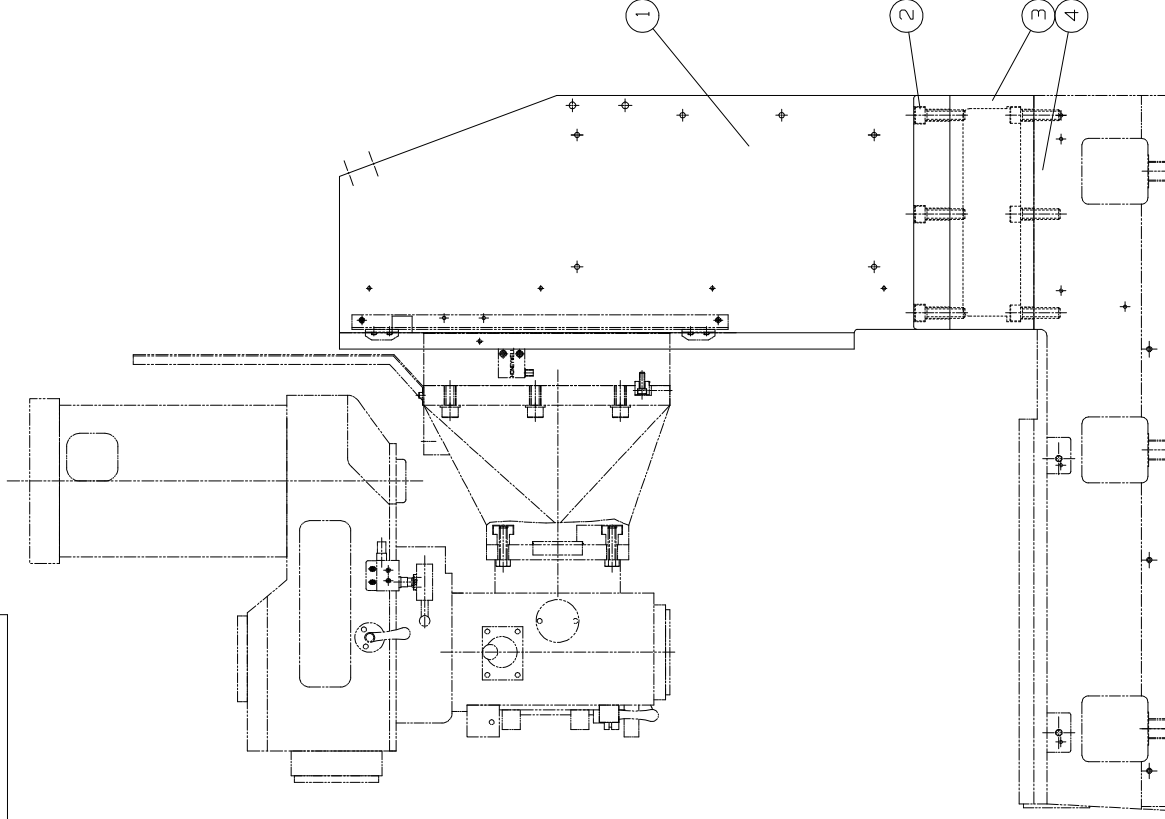
<u>Vendor#</u>	<u>Part Description</u>	<u>Milltronics Part #</u>	<u>Vendor#</u>	<u>Part Description</u>	<u>Milltronics Part #</u>
J-132	Motor locknut handle		J-284	Black plastic ball handle	MP4B-31
J-133	Motor mounting studs		J-285	Screw	
J-134	Motor mounting studs		J-286	Woodruff Key	
J-135	Cluster gear key		J-287	Woodruff Key	
J-136	Worm cradle bushing		J-288	Snap ring	
J-138	Pin		J-289	Hex nut hardened	
J-139	Collet aligning screw	MPZ-17	J-290	Bearing locknut	
J-140	Worm gear	MHVS-575	J-291	Lockwasher	
J-141	Tilting worm gear shaft	MHVS-576	J-292	Bearing	
J-142	Key	MHVS-577	J-293	Bearing	
J-143	Socket set screw	MHVS-578	J-294	Wick	
J-144	Gear	MHVS-579	J-295	Gits oil cup	
J-145	Feed shift rod		J-296	Roll pin	
J-147	Cluster gear shaft upper bearing		J-197	Spring	
J-148	Pinion shaft hub screw	MHVS-582	J-298	Socket set screw	
J-149	Drawbar washer		J-299	Woodruff Key	
J-150	Putside clock spring pin		J-300	Hex jam	
J-151	Trip lever pin	MPM-14	J-301	Double seal bearing	
J-152	Back gear shift bushing		J-303	Needle bearing	
J-153	Backgear shift crank		J-304	Hex jam nut	
J-154	Clutch ring pin		J-305	Quill bearing	
J-155	Bolt		J-308	Pin	
J-157	Quill microstop nut		J-309	Roll pin	
J-159	Key for #30 std taper spindle		J-310	Steel ball	MPM-11
J-166	Spindle		J-311	Compression spring	MPM-10
J-167	Quill set screw	MHVS-593	J-312	Set Screw	MPM-09
J-169	Spindle dirt shield		J-313	Set Screw	
J-170	Bearing spacer-large		J-318	Lockwasher	
J-171	Bearing spacer - small	MP-1105	J-319	Waldes Snap ring	MHVS-666
J-172	Nose piece	MHVS-597	J-321	Safety clutch spring	MPM-08
J-176	Sleeve	MHVS-598	J-322	Micrometer scale	MPM-07
J-188	Feed worm shaft		J-323	Screw	
J-190	Special hex nut - optional	MHVS-600	J-324	Feed reverse bevel gear	
J-192	Washer	MHVS-601	J-326	Wrench	
J-193	Plug for 5/8 hole		J-327	Steel pinion	
J-250	Socket set screw		J-328	Clock Spring	MPM-74
J-251	Socket cap screws		J-330	Compression spring	
J-252	Socket cap screws		J-331	Kohinoor Snap ring	
J-253	Snap ring		J-333	Black plastic ball handle	
J-254	Washer		J-334	Dowel pin	
J-255	R head screw		J-335	Split lockwasher	
J-256	Compression spring		J-338	Gits oil cup	
J-257	K.P Socket set screws		J-339	Spindle speed plate	
J-258	V belt		J-340	Operating instruction plate	
J-259	Flat head screws		J-345	Socket set screw	
J-261	Roll pin		J-348	Bearing	BG-22
J-262	Compression spring		J-349	Bearing	BG-12
J-263	Set screw		J-350	Lockscrew	
J-264	Cap screw		J-351	Lockscrew	
J-265	Cap screw		J-352	Dowel pin	MPM-06
J-166	Pin		J-353	Bushing	
J-163	Screw		J-355	Std. Hex nut	
J-267	Cap screw		J-356	Floploc Stop & locknut	
J-268	Socket set screw		J-358	Socket set screw	
J-259	Socket head cap screw		J-359	Jam nut	
J-272	Lock nut	MHVS-623	J-362	Jam nut	
J-273	Lockwasher	MHVS-624	J-363	External lockwasher	
J-274	Lockwasher		J-365	Roll pins	
J-274	Socket set screw		J-366	Name plate	
J-275	Socket set screw		J-368	Oil strainer for quill brg	
J-276	Screw		J-389	Switch bracket	
J-278	Screw		M-72	Washer	
J-279	Socket set screw	MPM-13	J-369	Shaft	
J-280	Roll pin	MPM-80	J-313	Screw	
J-281	Dowel pin		J-401	Motor	
J-282	Roll pin		J-408	Cover	
J-283	Roll pin	MPM-12	J-369	Shaft	



Chip guard
MPS-314

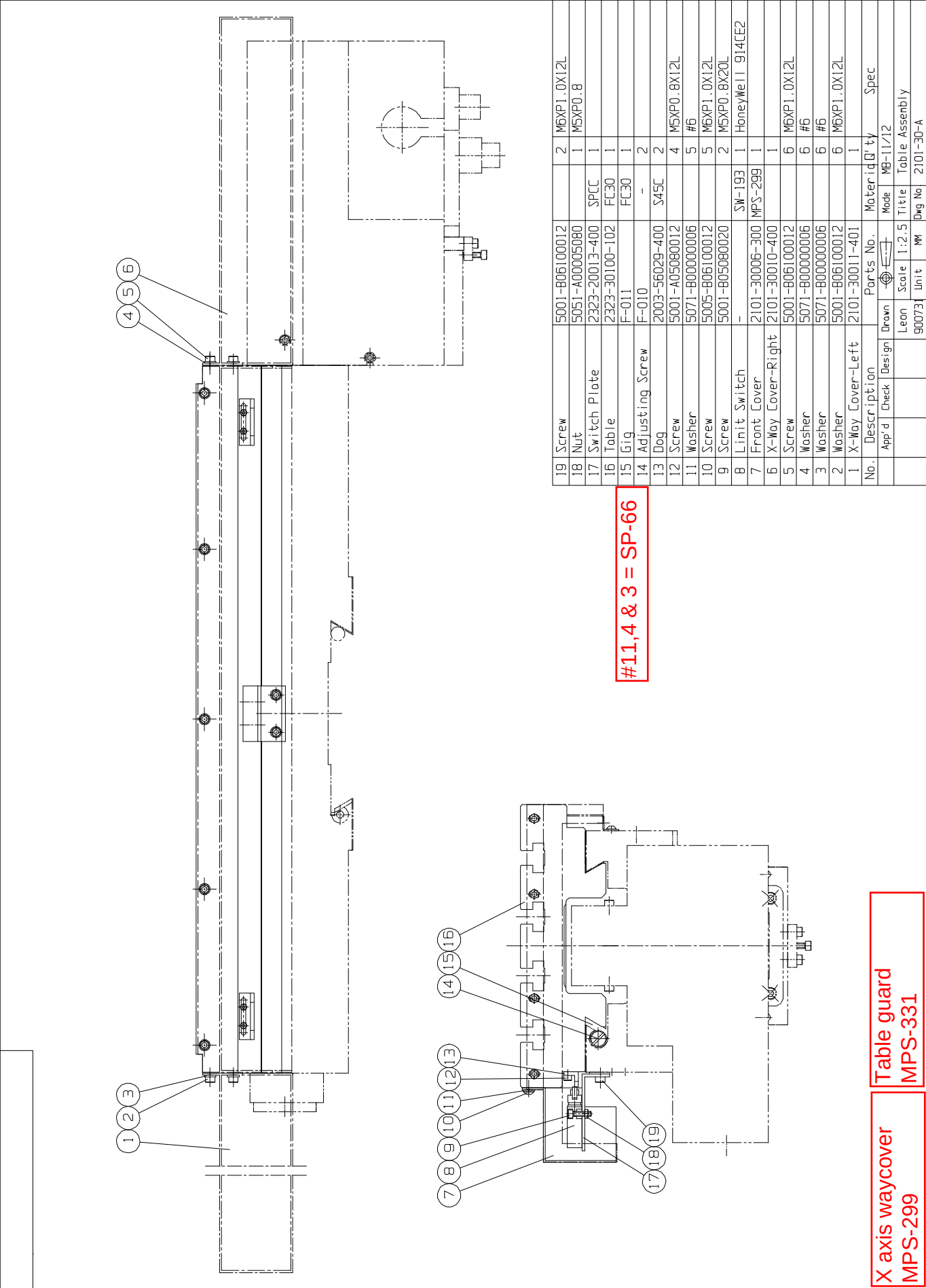
MA-21

**Worklight MA-111
Bulbs for MA-111-MA-110**



10								
9								
8								
7								
6								
5								
4	Screw	5001-B16200060						6 M16XP2.0X60L
3	Riser Block	F-002			FC25	1		
2	Screw	5001-B16200060						6 M16XP2.0X60L
1	Column	F-001			FC30	1		
No.	Description	Ports No.	Material	Qty	Spec			
App'd	Check	Design	Drawn	Scale	1:1.5	Title	Column Assembly	
			Leon	900731	Unit	MM	2101-10-A	

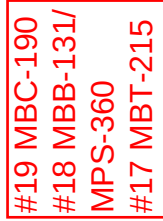
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19	Screw	5001-806100012	2	M6XP1.0X12L
18	Nut	5051-A00005080	1	M5XP0.8
17	Switch Plate	2323-20013-400	1	SPCC
16	Table	2323-30100-102	1	FC30
15	Gig	F-011	1	FC30
14	Adjusting Screw	F-010	2	-
13	Dog	2003-56029-400	2	S45C
12	Screw	5001-A05080012	4	M5XP0.8X12L
11	Washer	5071-800000006	5	#6
10	Screw	5005-806100012	5	M6XP1.0X12L
9	Screw	5001-805080020	2	M5XP0.8X20L
8	Limit Switch	-	1	SW-193
7	Front Cover	2101-30006-300	1	MPS-299
6	X-Way Cover-Right	2101-30010-400	1	
5	Screw	5001-806100012	6	M6XP1.0X12L
4	Washer	5071-800000006	6	#6
3	Washer	5071-800000006	6	#6
2	Washer	5001-806100012	6	M6XP1.0X12L
1	X-Way Cover-Left	2101-30011-401	1	
No.	Description	Parts No.	Material	Qty
App'd	Check	Design	Drawn	Mode
Leon	Scale	1:2.5	Title	Table Assembly
900731	Unit	MM	Dwg No	2101-30-A

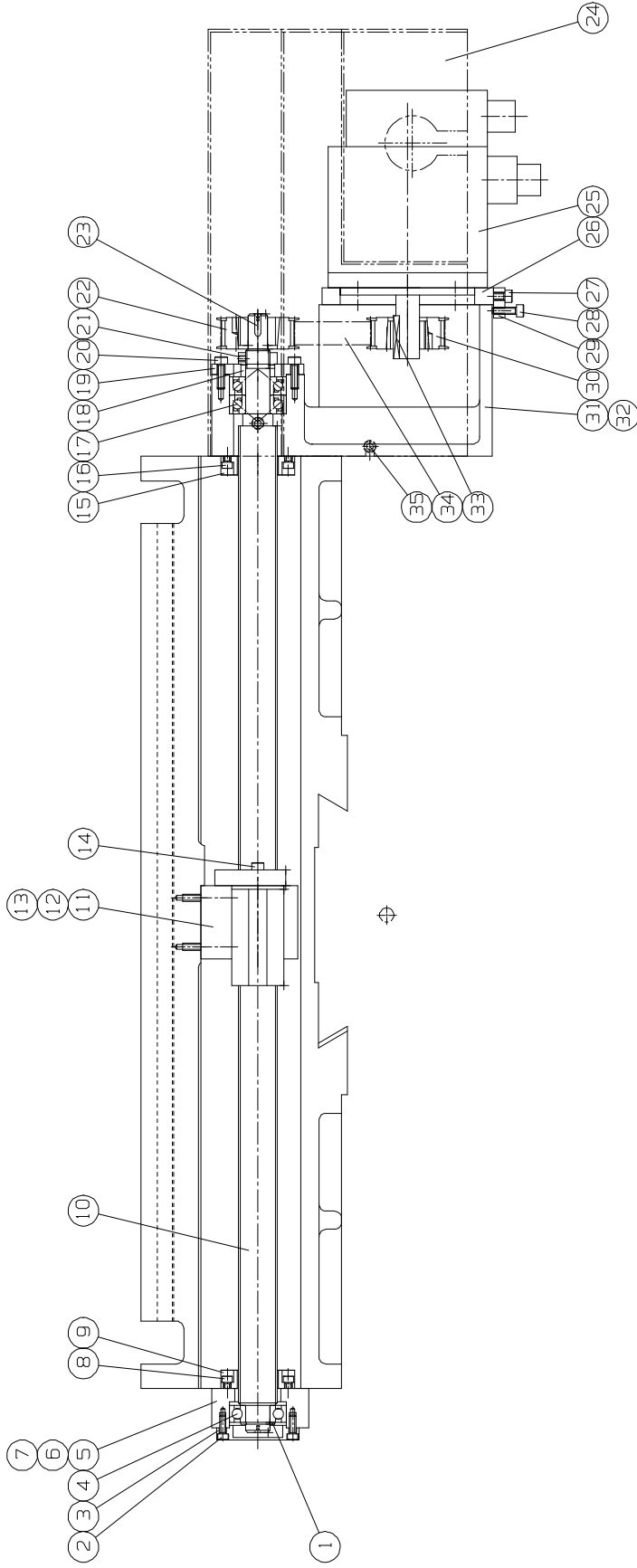
X axis waycover
MPS-299

Table guard
MPS-331



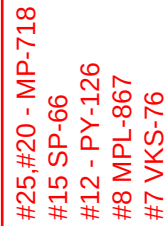
Flood tank sight
gauge MPS-356

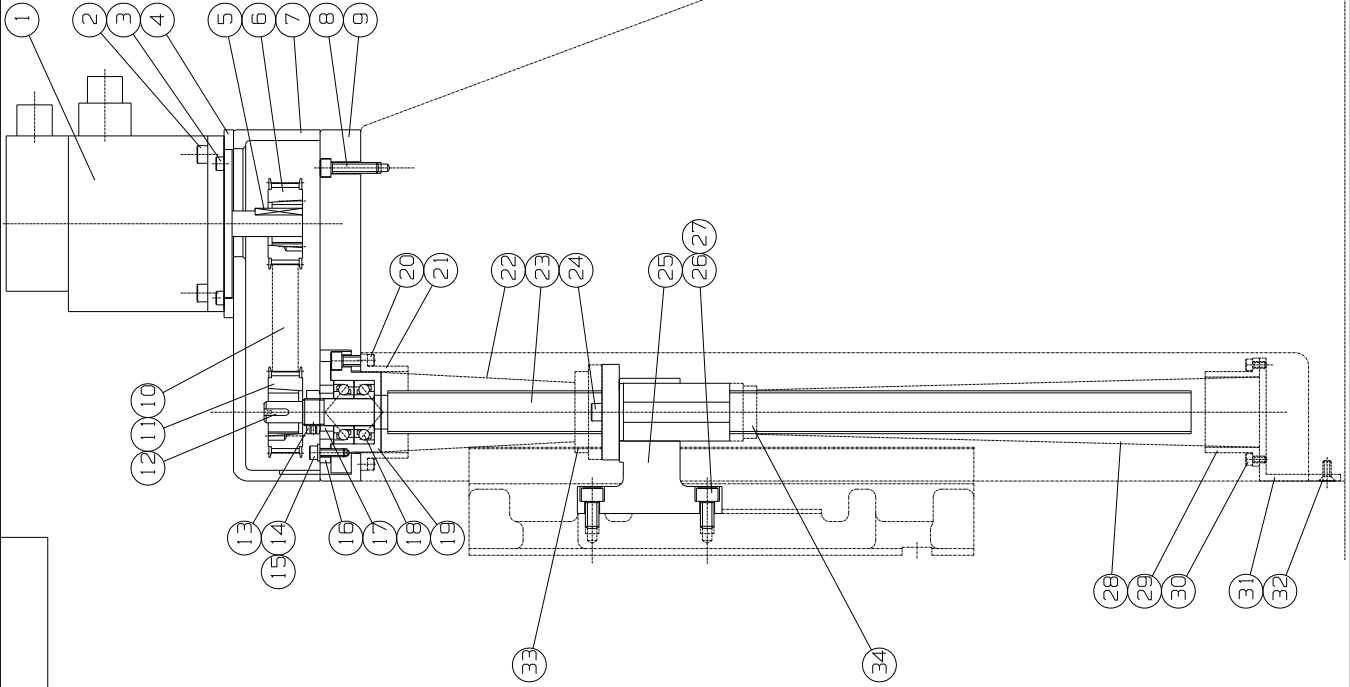
19							8	Leveling Pad	F-016			FC25	6
18							7	Leveling Bolt	F-015			S45C	6
17	Coolant Hose	-				1	Ø13XØ19X1m	Front Cover	F-014			SPCC	1
16	PUMP	F-020	MA-267			1		Screw	5001-A08125015			M8XP1.25X15L	4
15	Tank Cover	F-019				1		Washer	5071-A00000012			#12	6
14	Tank	F-018				1		Screw	5001-A12175050			M12XP1.75X50L	6
13	Scale	F-017				1		Base	F-013			FC30	1
12	Coolant Hose	-				1	Ø13XØ19X4m	Stand	F-012			FC25	1
11	Fitting	-				1	PT3/4	No.	Description	Parts No.		Material	Qty Spec
10	Check Valve	-				1	PT3/4	App'd	Check	Design		Model	MB-11/12
9	Fitting	-				1	PT3/4					Title	Base Assembly
No.	Description	Parts No.					Material	Qty	Spec	Dwg No			2101-40-A



#31 VKS-76
#25 MO-123
#15 & #9= MP-718

35	Screw	5005-B06100012	2	M6XP1.0X12L	16	Screw	5001-A05080012	2	M5XP0.8X12L
34	Belt	2323-51020-400	1	165L075	15	Rubber Stop	2323-51015-400	PDM	1
33	Key	5121-A05005035	1	5X5X35L	14	Screw	5001-A08125025	4	M8XP1.25X25L
32	Taper Pin	-	2	#5	13	Taper Pin	-	2	#6
31	Motor Bracket Housing	2323-51010-300	FC25	1	12	Screw	5001-A06100025	4	M6XP1.0X25L
30	Pulley-Motor	2323-51006-400	PY-126	1	10	Carrier	2323-51009-401	FC25	1
29	Adjusting Plate	2323-51017-400	S45C	1	10	Ball Screw	2323-51100-400	MPB-02	1
28	Screw	5001-A06100020	2	M6XP1.0X20L	9	Rubber Stop	2323-51015-400	PDM	1
27	Screw	5001-A06100020	2	M6XP1.0X20L	8	Screw	5001-A05080012	2	M5XP0.8X12L
26	Motor Plate	2323-51011-401	S45C	1	7	Taper Pin	-	2	#5
25	Servo Motor	-	1	YASKAWA 05A	6	Screw	5001-A08125030	2	M8XP1.25X30L
24	Motor Cover	2323-51018-301	SPCC	1	5	Bracket	2323-51016-300	FC20	1
23	Key	-	1	3/16X3/16X18	4	Ball Bearing	-	BG-02	1
22	Pulley-Ball Screw	2323-51007-400	PY-126	1	3	Cover-Left End	2323-51012-400	S45C	1
21	Nut	-	1	YSR M20X1.0	2	Screw	5001-A05080015	4	M5XP0.8X15L
20	Screw	5001-A06100020	S45C	4	1	C-Snap	5141-A00000020	1	#20
19	Bearing Cup	2323-51013-400	S45C	1	No.	Description	Parts No.	Materid	Q'ty
18	Spacer	2323-51014-400	S45C	1	App'd	Check	Design	Drawn	Mode
17	Ball Bearing	-	BG-102	2	20TAC47B	Leon	Scale	1:2.5	Title
No.	Description	Parts No.	Materid	Q'ty	Spec	90073	Unit	MM	Dwg No

[illegible]



March 6, 2001 - Changed motor and ballscrew pulleys to 18:24 tooth, belt remains 18L075
All machines to date have been shipped this way.

#23 Cut MPB-02 to 26.58" length before shipping replacement ballscrew.

35	Tube	-	S45C	1	
34	Tube	-	S45C	1	
33	Screw	5007-A06100012	4	MBXP1.0X12L	
32	Bracket	F-030	SS41	1	
31	Screw	F-029	S45C	1	
30	Tube	F-028	-	2	#6
29	Spring Hood-Lower	5001-A10150025	FC25	1	M10XP1.5X25L
28	Taper Pin	2323-53002-401	MPB-02	1	2
27	Screw	5001-A08125025	1		2
26	Yoke	2323-53100-400	1		2
25	Screw	F-027	S45C	1	
24	Ball Screw	See Note #23	1		
23	Spring Hood-Upper	F-026	S45C	1	
22	Tube	F-025	S45C	1	
21	Screw	-	2	20TAC47B	
20	Bearing Seat	2323-51014-400	S45C	1	
19	Ball Bearing	2323-51013-400	S45C	1	
18	Spacer	5071-A00000006	4	#6	
17	Bearing Cup	5001-A06100020	4	MBXP1.0X20L	
16	Washer	-	1	YSR M20XP1.0	
15	Screw	2323-51007-400	PY-148	1	24L075
14	Nut	2323-53020-400	BT-09	1	18L075
13	Key	F-024	FC25	1	
12	Pulley-Ball Screw	5001-A08125035	6	MBXP1.25X35L	
11	Belt	F-023	FC25	1	
10	Bracket	2323-51006-400	PY-61	1	18L075
9	Motor Bracket Housing	5121-A05005035	1	5X5X35L	
8	Key	F-022	S45C	1	
7	Motor Plate	5001-A06100015	6	MBXP1.0X15L	
6	Screw	5001-B08125025	4	MBXP1.25X25L	
5	Servo Motor	-	MO-126	1	YASKAWA 09A
4	Description	App'd	Check	Design	Drawn
3		Leon	Scale	1:2.5	Title
2		90073	Unit	MM	Dwg No
1					2101-53-A

Lubricating VK Machines:

Z AXIS RAILS:

Using Mobilx EP lubricant (see spec. sheet), grease the Z-axis rails monthly. Grease fitting can be located on the top and bottom of the rails on both sides.

Head:

Using Mobilx EP lubricant (see spec. sheet) grease the head monthly. There is a grease fitting on the right side of the head near the High/Low gear and on the left side of the head near the quill feed selector. The *oil cups* can be filled periodically. One oil cup can be found on the front of the head, the other cup is near the High/Low gear.

AUTO LUBRICATOR:

The auto oiler should be checked weekly. Make sure the oiler is filled and is working properly.

DISCHARGE VOLUME PER CYCLE:

Adjustable from 2.5 CC minimum to 5.0 CC maximum. To reduce oil delivery remove the lock screw, measure A (Fig. 1), turn Adjusting screw clockwise increasing dimension A in the increment (corresponding to the desired discharge) as shown. (Table 1)

IN.	DISCHARGE	NOTES:
.400	2.5 c.c.	
.320	3.0 c.c.	
.240	3.5 c.c.	
.160	4.0 c.c.	
.080	4.5 c.c.	
0.00	5.0 c.c.	Break In Value

(Table 1)

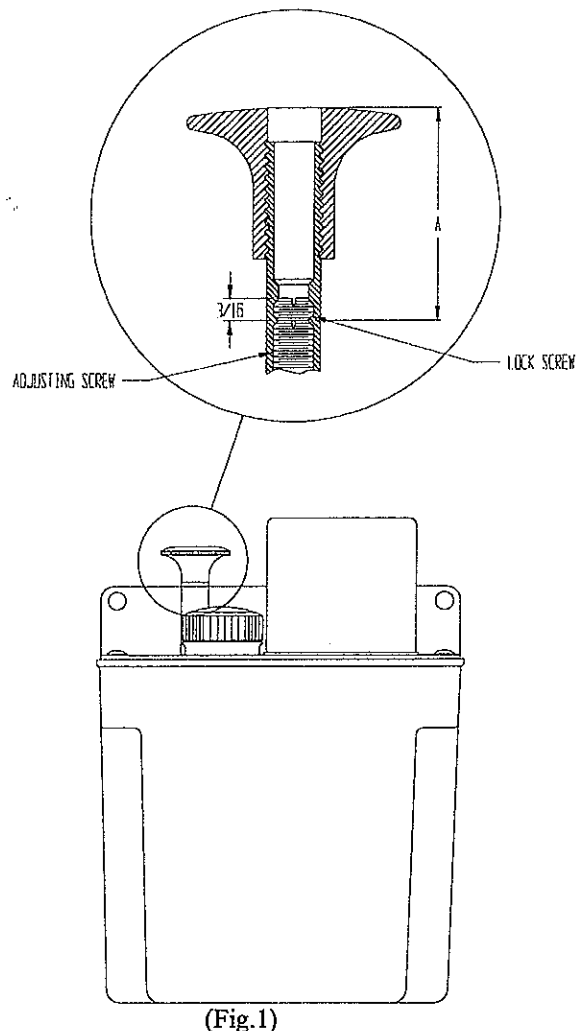
DISCHARGE PRESSURE: 60 psi Maximum.

Peak system Pressure will decrease when:

- (a) Discharge volume decreases.
- (b) Number of Meter-Units in system increases.
- (c) Oil viscosity decreases.

OIL VISCOSITY RANGE: See specification sheet

RECOMMENDED OIL: Mobil Vactra Oil No. 2



(Fig.1)

Procedure to adjust CESD (MA-219) Lubrication Unit

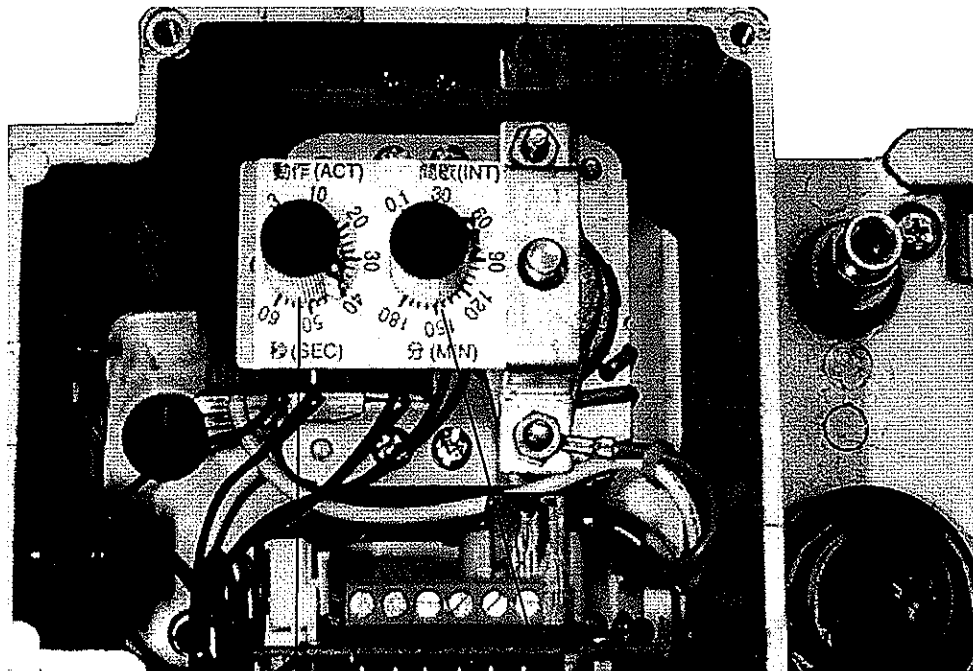
As long as the machine is reset the oiler will be pumping. In the event that the tank falls below the **MIN** line on the tank an audible alarm will sound. The machine will not let a program start with a low lube alarm (**451 Low Lube Fault**)

The **MA-219** has the ability to set the time between each pump cycle. It will pump the same amount of way lube (**.13 Liters/Min**) each pump cycle. We are not varying the amount of oil but the interval between each pump cycle. A new machine shipped from Milltronics will have the oiler pumping Aprox. 5 seconds every 25 to 30 minutes.

Adjusting the Seconds knob (left) will change the length of time in seconds the pump cycle for (.13 Liters/Min). Adjusting the Minute knob (right) will change the time between each pump interval. It will always pump the same amount

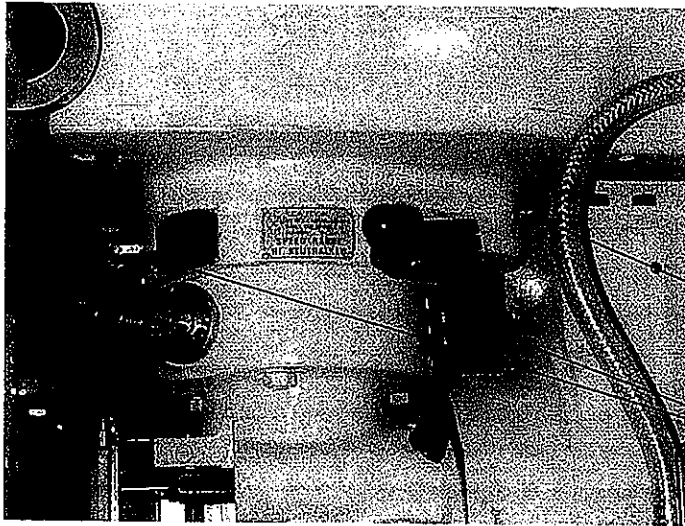
To adjust the intervals between each cycle of the pump:

1. Remove the 4 screws holding the top cover.
2. Adjust the two knobs shown below.
3. The dials are very sensitive. Turn them very slowly.



Turn this dial to vary the seconds that it pumps for each minute interval.

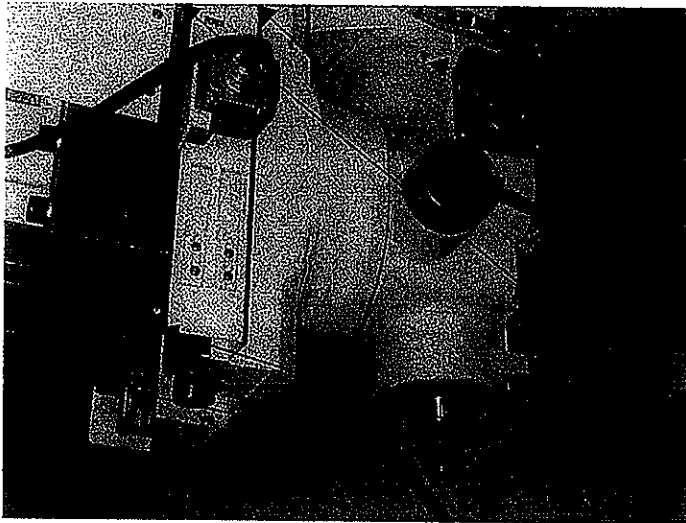
Turn this dial to vary the minutes between each pump cycle.



Grease Fitting for Head (Multipurpose EP)
Frequency- once a month

Oil Cups (A few drops weekly)

Right Side



Grease Fitting for Head (Multipurpose EP)
Frequency- once a month

Z-Axis Rails (Multipurpose EP)
Frequency- once a month

Left Side

<i>MOBILITH AW SERIES, MULTIPURPOSE EP GREASE</i>	
PRODUCT NUMBER	64352-8
NLGI GRADE	1
COLOR	GREEN
STRUCTURE	SMOOTH/TACKY
SOAP TYPE	LITHIUM COMPLEX
MINERAL OIL VISCOSITY	
cST AT 40°C	150
cST AT 100°C	13
SUS AT 100°F	750
SUS AT 210°F	70
ISO VISCOSITY GRADE	150
PENETRATION AT 23°C (77°F), WORKED	325
DROPPING POINT, ASTM D 2265, F°	475
TIMKEN OK LOAD, ASTM D 2509, lb	40
FOUR-BALL EP TEST, ASTM D 2596, WELD LOAD, kg	250
LOAD WEAR INDEX	40
FOUR-BALL WEAR TEST, ASTM D 2266, SCAR DIAMETER, mm, MAX	0.5
CORROSION PREVENTION, ASTM D 1743	PASS
WHEEL BEARING TEST, ASTM D 4290 MODIFIED, LEAKAGE, GRAM	5

<i>MOBIL VACTRA OIL No. 2</i>	
PRODUCT NUMBER	60049-4
SPECIFIC GRAVITY, 60/60F	0.88
POUR POINT, °C (°F), max.	-9 (16)
FLASH POINT, °C(°F), min.	244 (472)
VISCOSITY	
cST AT 40°C	68
cST AT 100°C	8.6
SUS AT 100°F	356
SUS AT 210°F	55
VISCOSITY INDEX	97
ISO VG	68
COLOR, ASTM D 1500	4
FZG, PASS STAGES	11
4 BALL WELD, kg, ASTM D 2783	160
4 BALL WEAR, mm, ASTM D 4172	0.22
COPPER CORROSION, ASTM D 130	1B
RUST, D665A	PASS
VICKERS V-104C, mg D 2882 (MOD)	-
CMCO, P-SPEC, APPROVAL	P-47
BIJUR PT 37-1 APPROVAL	PASS
OKUMA APPROVAL	PASS

Checking and Adjusting Backlash

Use a good solid magnetic base and a .0005 Inch indicator. Install the magnetic base on the machine table in close proximity to the spindle. Clean the area that the indicator will be in contact with.

Go into PARAMETERS/AXIS arrow down to BACKLASH press F1 EDIT and set X, Y and Z to zero. *(Before setting them to zero note original settings)*

Find the high spot on the spindle by moving the indicator back and forth and set indicator to zero. *(See point A on Fig. 4)*

The next step is easiest if done in jog mode. *(Select distance and 1 inch increments)*
You may have to press the jog key several times for the desired direction to clear the spindle.

Press the jog key for the desired direction for A to move towards D *(see Fig. 4)* and then back to A, the indicator may have moved, adjust it back to zero and repeat this step until it stays at zero.

Jog the desired axis or tool *(see Fig. 4)* from point A to B to C back to B then back to the start point A. The reading on the indicator is backlash and should be put into the backlash parameter under PARAMS-SETUP-AXIS.

After putting the backlash into the table, repeat the procedure to ensure the numbers took affect. If the indicated error seems to increase this is addlash, and you may have to subtract the indicated number from the backlash chart.

*The X axis procedure is shown, repeat procedure for Y and Z.
Remember to save these new changes to your parameter disk.*

(The diagram below is an example of checking your backlash in the X-axis.)

